48/50PD05,06
Single Package Displacement Ventilation or Single Zone Variable Airflow Rooftop Units
Electric Cooling/Gas Heating with PURON® (R-410A) Refrigerant and *COMFORT*Link™ 2.x Controls

Carrier®
Turn to the Experts℠

Controls, Start-Up, Operation, Service and Troubleshooting Instructions

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Printed in U.S.A. Edition Date: 6/09 **Catalog No:48-50PD-02T**

Replaces: 48-50PD-01T

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SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment. Untrained personnel can perform the basic maintenance functions of replacing filters. Trained service personnel should perform all other operations.

When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply. Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguishers available for all brazing operations.

Follow all safety codes. Wear safety glasses and work gloves. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies a hazard which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lockout tag. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may cause equipment damage.

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

⚠ WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in personal injury, death and/or property damage.

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Refer to the User's Information Manual provided with this unit for more details.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

What to do if you smell gas:

1. DO NOT try to light any appliance.
2. DO NOT touch any electrical switch, or use any phone in your building.
3. IMMEDIATELY call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
4. If you cannot reach your gas supplier, call the fire department.

GENERAL

This publication contains Start-Up, Controls, Operation, Service, and Troubleshooting information for the 48/50PD rooftop units. (See Table 1.) These units are equipped with *Comfort*Link™ controls version 1.X or higher and use Puron® refrigerant. The specific base unit installation instructions and/or wiring label diagram may also be required in conjunction with this book as a guide to a specific unit on the roof. All the units in Table 1 are Displacement Ventilation or Single Zone Variable Airflow units that provide stand-alone or network operation.

Table 1 – Rooftop Units

MODEL	SIZE	NOMINAL TONS
48/50PD	05	4
	06	5

BASIC CONTROL USAGE

*Comfort*Link Control

The *Comfort*Link control is a comprehensive unit-management system. The control system is easy to access, configure, diagnose and troubleshoot.

The *Comfort*Link control is fully communicating and cable-ready for connection to the Carrier Comfort Network® (CCN) building management system. The control provides high-speed communications for remote monitoring via the Internet. Multiple units can be linked together (and to other *Comfort*Link control equipped units) using a 3-wire communication bus.

The *Comfort*Link control system is easy to access through the use of a unit-mounted display module. There is no need to bring a separate computer to this unit for start-up. Access to control menus is simplified by the ability to quickly select from 11 menus. A scrolling readout provides detailed explanations of control information. Only four, large, easy-to-use buttons are required to maneuver through the entire controls menu. The display readout is designed to be visible even in bright sunlight.

For added service flexibility, an accessory hand-held Navigator™ module is also available. This portable device has an extended communication cable that can be plugged into the unit's communication network at the main control box. The Navigator display provides the same menu structure, control access and display data as is available at the unit-mounted Scrolling Marquee display.

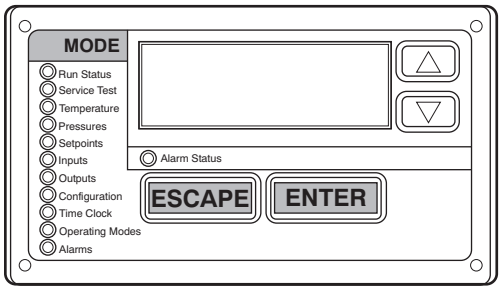

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Fig. 1 - Scrolling Marquee

Scrolling Marquee

This device is the keypad interface used to access the control information, read sensor values, and test the unit. The Scrolling Marquee is located in the main control box and is standard on all units. The Scrolling Marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display module. The display also contains an Alarm Status LED. (See Fig. 1.)

The display is easy to operate using 4 buttons and a group of 11 LEDs that indicate the following menu structures:

- Run Status
- Service Test
- Temperatures
- Pressures
- Set points
- Inputs
- Outputs
- Configuration
- Timeclock
- Operating Modes
- Alarms

Through the Scrolling Marquee, the user can access all of the inputs and outputs to check on their values and status, configure operating parameters plus evaluate the current decision status for operating modes. The control also includes an alarm history which can be accessed from the display. In addition, through the Scrolling Marquee, the user can access a built-in test routine that can be used at start-up commissioning and to diagnose operational problems with the unit.

Accessory Navigator Display

The accessory hand-held Navigator display can be used with the 48/50PD units. (See Fig. 2.) The Navigator display operates the same way as the Scrolling Marquee device. The Navigator display is plugged into the LEN (local equipment network) port on either TB1 or the J3 port on the ECB (economizer control board).

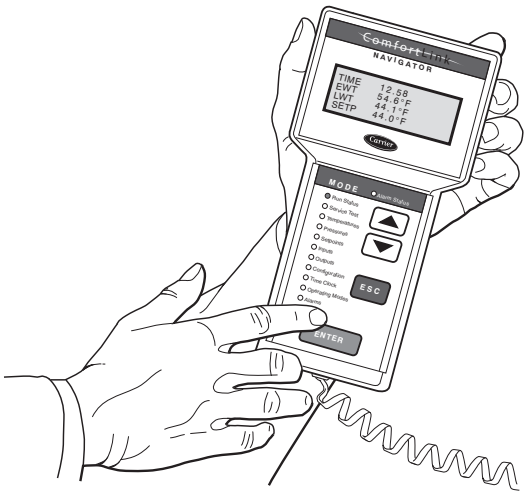

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Fig. 2 – Accessory Navigator Display

Operation

All units are shipped from the factory with the Scrolling Marquee display, which is located in the main control box. (See Fig. 1.) In addition, the *Comfort*Link control also supports the use of the handheld Navigator display.

Both displays provide the user with an interface to the *Comfort*Link control system. The displays have up and down arrow keys, an ESCAPE key and an ENTER key. These keys are used to navigate through the different levels of the display structure. The Navigator display and the Scrolling Marquee operate in the same manner, except that the Navigator display has multiple lines of display and the Scrolling Marquee has a single line. All further discussions and examples in this document will be based on the Scrolling Marquee display. See Table 2 for the menu structure.

The four keys are used to navigate through the display structure, which is organized in a tiered mode structure. If the buttons have not been used for a period, the display will default to the AUTO VIEW display category as shown under the RUN STATUS category. To show the top-level display, press the ESCAPE key until a blank display is shown. Then use the up and down arrow keys to scroll through the top-level categories. These are listed in Appendix A and will be indicated on the Scrolling Marquee by the LED next to each mode listed on the face of the display.

When a specific mode or sub-mode is located, push the ENTER key to enter the mode. Depending on the mode, there may be additional tiers. Continue to use the up and down keys and the ENTER keys until the desired display item is found. At any time, the user can move back a mode level by pressing the ESCAPE key. Once an item has been selected the display will flash showing the item, followed by the item value and then followed by the item units (if any).

Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the four digits of the password. The default password is 1111.

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description across the display indicating the full meaning of each display point. Pressing the ESCAPE and ENTER keys when the display is blank (MODE LED level) will return the display to its default menu of rotating AUTO VIEW display items. In addition, the password will need to be entered again before changes can be made.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. If the display is in rotating auto-view, press the ENTER key to stop the display at the desired item. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value of state of an item and press the ENTER key to accept it. Press the ESCAPE key and the item, value or units display will resume. Repeat the process as required for other items.

There are some points that can be forced from the Scrolling Marquee or the Navigator. If the user needs to force a variable, follow the same process as when editing a configuration parameter. A forced variable, regardless where the force has come from will be displayed with a blinking "." on a Scrolling Marquee and a blinking "f" on a Navigator following its value. For example, if economizer commanded position (EC.CP) is forced, the Navigator display shows "80f", where the "f" is blinking to signify a force on the point. The Scrolling Marquee display shows "80." Where the "." is blinking to signify a force on the point. Remove the force by selecting the point that is forced with the key ENTER and then pressing the up and down arrow keys simultaneously.

Depending on the unit model, factory-installed options and field-installed accessories, some of the items in the various Mode categories may not apply.

System Pilot™ and Touch Pilot Devices

The System Pilot device (33PILOT-01) and Touch Pilot device (33CNTPILOT) can be used as CCN communication user-interfaces. These devices can be put on the CCN bus and addressed to communicate with any other device on the network. Unlike the Scrolling Marquee and Navigator, these pilots read the 48/50PD's CCN tables and the units CCN points can be monitored, forced, or configured.

IMPORTANT: Multiple zoning application is NOT recommended at this time with the PD products.

Additionally, the System Pilot device can serve as a wall-mounted temperature sensor for space temperature measurement. The occupant can use the System Pilot device to change set points. A security feature is provided to limit access of features for unauthorized users. See Fig. 3 for System Pilot device details.

CCN Tables and Display

In addition to the unit-mounted Scrolling Marquee display, the user can also access the same information through the CCN tables by using the Service tool or other CCN programs/devices. The variable names used for the CCN tables and the Scrolling Marquee menus may be different and more items may be displayed in the CCN tables. Details on the CCN tables are included with the local display menus in Appendix A. Appendix A is structured towards the organization of the local display (Scrolling Marquee) menus. Because of the variety of CCN programs and devices, the CCN tables, sub-tables, and points are referenced within that organization.

Table 2 – Scrolling Marquee Mode and Menu Display Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SETPOINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto View of Run Status (VIEW) ↓ Software Version Numbers (VERS) ↓ Control Modes (MODE) ↓ Cooling Status (COOL) ↓ Heating Status (HEAT) ↓ Economizer Status (ECON) ↓ Component Run Hours (HRS) ↓ Component Starts (STRT)	Service Test Mode (TEST) ↓ Test Independent Outputs (INDP) ↓ Test Fans (FANS) ↓ Test Cooling (COOL) ↓ Test Heating (HEAT)	Air Temperatures (AIR.T) ↓ Refrigerant Temperatures (REF.T)			General Inputs (GEN.I) ↓ Current Sensor Inputs (CS.IN) ↓ Air Quality Inputs (AIR.Q)	Fan Outputs (FANS) ↓ Cool Outputs (COOL) ↓ Heat Outputs (HEAT) ↓ Economizer Outputs (ECON) ↓ Alarm Relay (ALRM)	Display Configuration (DISP) ↓ Unit Configuration (UNIT) ↓ Cooling Configuration (COOL) ↓ Heating Configuration (HEAT) ↓ Economizer Configuration (ECON) ↓ Air Quality Cfg. (AIR.Q) ↓ Alarm Relay Config. (ALM.O) ↓ PID Configuration (PID) ↓ Sensor Calibration (TRIM) ↓ CCN Configuration (CCN)	Time of Day (TIME) ↓ Month, Date Day and Year (DATE) ↓ Daylight Savings Time (DST) ↓ Local Time Schedule (SCH.L) ↓ Local Holiday Schedules (HOL.L)	Control Modes (MODE) ↓ Cool Mode Diagnostic (COOL) ↓ Heat Mode Diagnostic (HEAT) ↓ Economizer Diagnostic (ECON) ↓ Demand Listing (DMD.L)	Reset All Current Alarms (R.CURR) ↓ Reset Alarm History (R.HIST) ↓ Currently Active Alarms (CURR) ↓ Alarm HIstory (HIST)

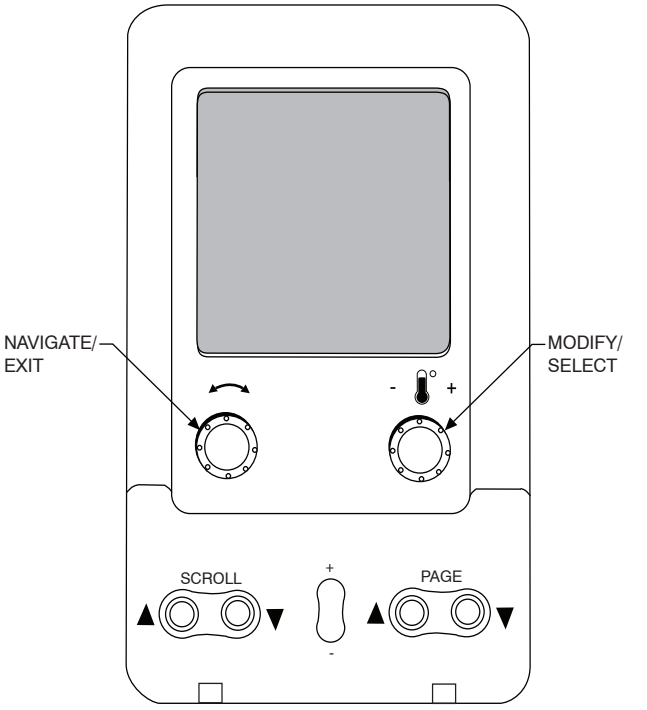

Fig. 3 - System Pilot™ User Interface

Force Hierarchy

There is a hierarchy in CCN with regards to forcing a point. Programs and devices write a force at different priority levels. A higher level (smaller number, 1 being the highest) will override a lower level force. The Scrolling Marquee uses a Control Force at level 7. The Navigator writes a Service Force which is level 3. System Pilots and Touch Pilots write Supervisor Forces at level 4. Network programs can be set to write different level priority forces.

Generic Status Display Table

The GENERIC points table allows the service/installer the ability to create a custom table in which up to 20 points from the 5 CCN categories (Points, Config, Service-Config, Set Point, and Maintenance) may be collected and displayed.

In the Service-Config table section, there is a table named "GENERICS." This table contains placeholders for up to 20 CCN point names and allows the user to decide which points are displayed in the GENERIC points sub-table under the status display table. Each one of these placeholders allows the input of an 8-character ASCII string. Using a CCN interface, enter the Edit mode for the Service-Config table "GENERICS" and enter the CCN name for each point to be displayed in the custom points table in the order they will be displayed. When done entering point names, download the table to the rooftop unit control.

IMPORTANT: The computer system software (ComfortVIEW™, Service Tool, etc.) that is used to interact with CCN controls, always saves a template of items it considers as static (e.g., limits, units, forcibility, 24-character text strings, and point names) after the software uploads the tables from a control. Thereafter, the software is only concerned with run time data like value and hardware/force status. With this in mind, it is important that any time a change is made to the Service-Config table "GENERICS" (which in turn changes the points contained in the GENERIC point table), that a complete new upload be performed. This requires that any previous table database be completely removed first. Failure to do this will not allow the user to display the new points that have been created and the CCN interface will have a different table database than the unit control.

Conventions Used in This Manual

The following conventions for discussing configuration points for the local display (Scrolling Marquee or Navigator™ accessory) will be used in this manual.

Point names will be written with the Mode name first, then any submodes, then the point name, each separated by an arrow symbol (→). Names will also be shown in bold and italics. As an example, the Fan Status Switch which is located in the Configuration mode, and Unit sub-mode would be written as ***Configuration→ UNIT→FN.SW.***

This path name will show the user how to navigate through the local display to reach the desired configuration. The user would scroll through the modes and sub-modes using the up and down keys. The arrow symbol in the path name represents pressing ENTER to move into the next level of the menu structure.

When a value is included as part of the path name, it will be shown at the end of the path name after an equals sign. If the value represents a configuration setting, an explanation will be shown in parenthesis after the value. As an example, ***Configuration→UNIT→FN.SW = 1 (Normal Open)***.

Pressing the ESCAPE and ENTER keys simultaneously will scroll an expanded text description of the point name across the display. The expanded description is shown in the local display tables but will not be shown with the path names in text.

The CCN point names are also referenced in the local display tables for users configuring the unit with CCN software instead of the local display. See Appendix A of this manual.

START-UP

IMPORTANT: Do not attempt to start unit, even momentarily, until all items on the Start-Up Checklist (last page) and the following steps have been completed.

Unit Preparation

Check that unit has been installed in accordance with these installation instructions and all applicable codes.

Compressor Mounting

Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts.

Refrigerant Service Ports

Each independent refrigerant system has a total of 3 Schrader-type service gauge ports per circuit. One port is located on the suction line, one on the compressor discharge line, and one on the liquid line. Be sure that caps on the ports are tight.

Crankcase Heater(s)

Compressor crankcase heater operation varies depending on the unit size and type. In general for all units, the crankcase heaters are energized if there is power to the unit, the compressor is not operating, and the ambient temperature is below 60°F.

IMPORTANT: Unit power must be on for 24 hours prior to start-up. Otherwise, damage to compressor may result.

Compressor Rotation

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in unit damage.

Improper wiring will cause compressor stoppage and alarm. Correct wiring by switching leads as indicated below.

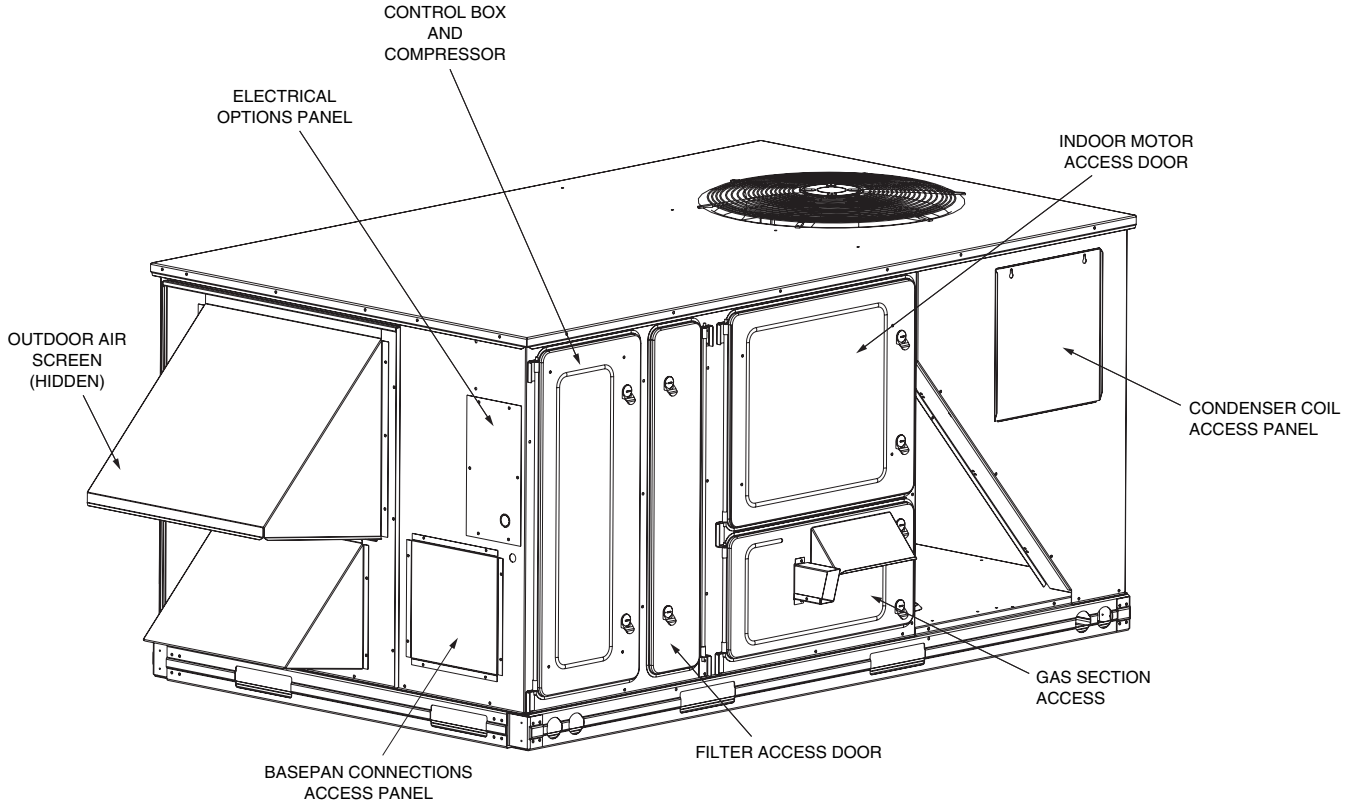

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Fig. 4 - Panel and Filter Locations

On 3-phase units, it is important to be certain the compressors are rotating in the proper direction. To determine whether or not compressors are rotating in the proper direction, use a phase-rotation meter on the unit input power to check for L1-L2-L3 or clockwise rotation or use the Service Test mode to energize a compressor. If the compressor is rotating in the wrong direction, the controls will stop the compressor and display alarm for "Circuit A Failure to Pressurize."

IMPORTANT: Indoor or outdoor fan rotation direction may not indicate proper input power phase sequence, as some 3-phase units use single-phase fan motors.

To correct the wrong compressor rotation direction, perform the following procedure:

1. Turn off power to the unit and lock out the power.
2. Switch any two of the incoming unit power leads.
3. Turn on power to the unit.
4. Verify corrected compressor rotation.

Power Supply

All 208/230-v units are factory wired for 230-v power supply. If the 208/230-v unit is to be connected to a 208-v power supply, the transformers (TRAN1 and TRAN2) must be rewired by moving the wire from the 230-volt connection and moving to the 200-volt terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

Internal Wiring

Check all electrical connections in unit control boxes; tighten as required.

Evaporator Fan Set-Up

The 48/50PD units are equipped with a Variable Frequency Drive (VFD). The VFD varies the frequency of the fan motor causing its speed to change. Fan belt and variable pulleys are also factory installed, but may need to be adjusted for specific applications. Check the fan to ensure its rotation is in the proper direction before adjusting performance. See Appendix C for unit specific fan performance data. See Appendix D for unit specific air quality limits, evaporator fan motor specifications, FIOP static pressures, and fan RPM for various motor pulley settings. Appendix C and D are based on 100% fan speed (VFD at 60Hz).

To alter fan performance via pulley settings, see Evaporator Fan Performance Adjustment in the Service section. The Supply Fan Minimum Speed (***Configuration→UNIT→FS.MN***) and the Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***) can also be used to alter fan performance. The fan should run at the maximum fan speed when setting up the application design point. The Supply Fan Minimum Speed (FS.MN) can be user configured between 10 and 70%. The Supply Fan Minimum Speed default value is 70%. This provides the greatest energy efficiency rating for a unit without an economizer in a mixed air type duct application. The Supply Fan Maximum Speed (FS.MX) can be configured between 80 and 100%. The Supply Fan Maximum Speed default value is 100%.

Set the indoor fan pulley to the application design point CFM for heating and cooling at 100% fan speed so that the CFM is not lower than the minimum CFM allowed in the product data. If the exact CFM can not be set by the half turn pulley settings then adjust the Supply Fan Maximum Speed (FS.MX) to fine tune the CFM to the application requirements. The VFD's settings should not be used for adjusting fan performance. Specific VFD information can be found in Appendix B.

IMPORTANT: The Supply Fan Maximum Speed (FS.MX) RPM must not produce a supply CFM that is lower that the minimum CFM allowed in the product data for heating and cooling. During heating mode, the fan speed is always set to Supply Fan Maximum Speed (FS.MX).

For units with a power exhaust option, the controls require an accurate supply duct CFM at the unit design point where the indoor fan will run at the Supply Fan Maximum Speed (FS.MX) for proper operation. The supply duct CFM is configured by the Indoor Fan Max Speed CFM (***Configuration→ECON→IDF.C***). Default values for Indoor Fan Max Speed CFM (IDF.C) are at 400 CFM per ton or 1600 CFM for the 05 size and 2000 CFM for the 06 size. It is preferred to use the supply duct CFM from an air balance report to configure the Indoor Fan Max Speed CFM (IDF.C). If an air balance report is not available, then use the fan tables supplied in this book to determine Fan Max Speed CFM (IDF.C). When using the fan tables to determine Fan Max Speed CFM (IDF.C) set Economizer Position Test (***Service Test→INDP→ECO***N) to 0 (Economizer Damper Closed) and Indoor Fan Speed Test (***Service Test→FANS→F.SPD***) equal to Supply Fan Maximum Speed (FS.MX). Measure the supply to return duct static pressure difference and indoor fan RPM. Make correction to static pressure for all options installed in the unit per the accessory pressure drop table. Determine Indoor Fan Max Speed CFM (IDF.C) on the fan table where the corrected static pressure and RPM cross.

Condenser Fans and Motors

Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section as required.

Return-Air Filters

Check that correct filters are installed in filter tracks (see Physical Data table in Installation Instructions). Do not operate unit without return-air filters.

IMPORTANT: For units with 4-in. filter option, units are shipped with standard 2-in. filters. To install 4-in. filters, the filter spacers must be removed.

Outdoor-Air Inlet Screens

Outdoor-air inlet screens must be in place before operating unit.

Accessory Installation

Check to make sure that all accessories including sensors have been installed and wired as required by the instructions and unit wiring diagrams.

Orifice Change (48PD Only)

This unit is factory assembled for heating operation using natural gas at an elevation from sea level to 2000 ft.

Use accessory high altitude kit when installing this unit at an elevation of 2000 to 7000 ft. For elevations above 7000 ft, refer to High Altitude section to identify the correct orifice size for the elevation. Purchase these orifices from your local Carrier dealer. Follow instructions in accessory Installation Instructions to install the correct orifices.

Use accessory LP (liquid propane) gas conversion kit when converting this unit for use with LP fuel usage for elevations up to 7000 ft. For elevations above 7000 ft, refer to High Altitude section to identify the correct orifice size for the elevation. Purchase these orifices from your local Carrier dealer. Follow instructions in accessory Installation Instructions to install the correct orifices.

Gas Heat (48PD Only)

Inspect the gas heat section of the unit. Verify the number of burners match the number of heat exchanger openings and the burner assembly is properly aligned. If the orifices were changed out for elevation or Liquid Propane purposes, verify proper installation. Visually inspect other components in heat section.

Verify gas pressures before turning on heat as follows:

1. Turn off field-supplied manual gas stop, located external to unit.
2. Connect pressure gauge to supply gas tap, located on field-supplied manual shutoff valve. (See Fig. 5.)
3. Connect pressure gauge to manifold pressure tap.
4. Turn on field-supplied manual gas stop. Enter Service Test mode by setting ***Service Test→TEST*** to "ON" using the Scrolling Marquee display. Use the Service Test feature to set ***Service Test→HEAT→HT.1*** to ON (first stage of heat) using the Scrolling Marquee.

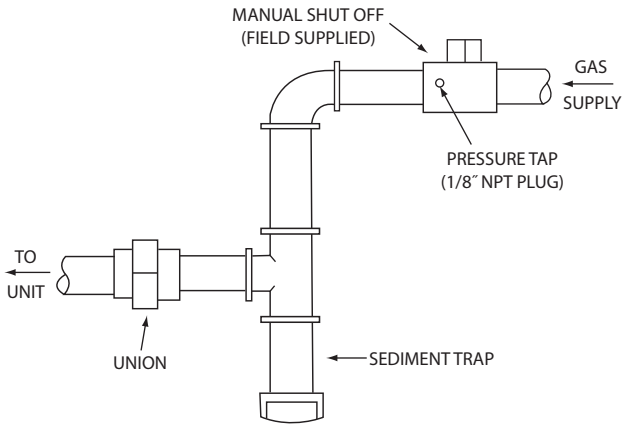

Fig. 5 - Field Gas Piping

5. After the unit has run for several minutes, verify the supply gas pressure is between 5.5-in. wg to 13.0-in. wg, and the manifold pressure is 3.50-in. wg on sizes 03-14 and 3.00 on size 16. If manifold pressure must be adjusted, refer to Gas Valve Adjustment section.

IMPORTANT: Supply gas pressure must not exceed 13.0-in. wg.

6. Set ***Service Test→HEAT→HT.1*** to OFF using Scrolling Marquee.
7. Exit Service Test mode by setting ***Service Test→TEST*** to "OFF" using the Scrolling Marquee.

CONTROLS QUICK SET-UP

The following information will provide a quick guide to setting up and configuring the 48/50PD series units with *Comfort*Link™ controls. Unit controls are pre-configured at the factory for factory-installed options. Field-installed accessories will require configuration at start-up. Service Test is recommended for initial start-up. Additionally, specific job requirements may require changes to default configuration values. See the CCN and Display parameter tables and other sections of these instructions for more details. Refer to the Major System Components or accessory installation instructions for specific wiring detail.

Control Set Point and Configuration Log

During start up, accessory installation, and equipment service set points and/or configuration changes might have to be made. When setting set points or changing configuration settings, documentation is recommended. The Control Log starting on page 106 should be filled out and left with the unit at all times. A copy should also be provided to the equipment owner.

Standard Unit Control

There are two different applications these units can be applied to, Displacement Ventilation and Single Zone VAV. For either application a direct wired space sensor can be used or a communicating sensor/thermostat can be used. Installation of an accessory supply air temperature (SAT) sensor in the supply duct is recommended when using a communication type control. A supply duct SAT measurement is valid for heating mode display, while the factory-standard internal SAT is not valid for heating due to its location upstream of the heating section. When installing the supply duct SAT, the heating mode display is enabled by setting ***Configuration→HEAT→SAT→SAT.H*** to ENBL.

There are several configurations that should be considered for Displacement Ventilation or Single Zone VAV applications. Table 3 shows these configuration defaults and specific application settings. These settings are typical values and should be adjusted for each actual specific unit application. Refer to the Operation section for more detail on these configurations and how they effect the units operation.

IMPORTANT: Multiple zoning application is not recommended at this time with the PD product.

Space Temperature Sensor Control—Direct Wired (T-55, T-56, or T-59)

Wire accessory space temperature sensor(s) to the T-55 terminals on the field connection terminal board located at the unit control box. No configuration is required when installing a T-55, T-56, or T-59. Refer to Field-Installed Accessories section for additional information.

T-58 Communicating Room Sensor

Install the T-58 communicating thermostat. Connect the CCN communication bus from the T-58 to the CCN terminals on the field connection terminal board located at the unit control box. Configure the unit's CCN communication element number, bus number, and baud rate. Configure the T-58's CCN communication bus number and baud rate the same as the unit, while the element number has to be different. Configure the T-58 to send SPT to the unit's element number. Refer to the Field-Installed Accessories section for additional information.

System Pilot - Communication Space Sensor

Install the System Pilot and connect the CCN communication bus from it to the units CCN connection on the low voltage terminal board. Configure the unit's CCN communication element number, bus number, and baud rate. Refer to the System Pilot's installation instructions for configuring it to be used as a space temperature and attaching it to a unit.

Gen III TEMP Monitor - Linkage Communication Thermostat (33CSTMT-01)

Install the linkage thermostat. Connect the CCN communication bus from the Stat to the CCN terminals on the field connection terminal board located at the unit control box. Configure the unit's CCN communication element number, bus number, and baud rate. Refer to the Linkage Thermostat's installation instructions for configuring the Stat and additional information about it.

Space Humidistat Control

The humidistat input is provided on the field connection terminal board. The Space Humidity Switch configuration, ***Configuration→UNIT→RH.SW***, identifies the normally open or normally closed status of this input at LOW humidity. TB1-R terminal is the 24VAC source for the dry contact and TB1-W2 terminal is the signal input.

Table 3 – Application Specific Configurations

ITEM	EXPANSION	DEFAULT	UNITS	DISPLACEMENT VENTILATION	SINGLE ZONE VAV
SASP	Cool Supply Air Setpoint	65	dF	65	55
FS.MX	Supply Fan Maximum Speed	100	%	100	100
FS.MN	Supply Fan Minimum Speed	70	%	20	70
FS.VM	Vent Mode Fan Speed	50	%	50	50
MIN.C	Min Compressor Capacity	70	%	15	70
FS.CD	Fan Speed Control Demand	3	∧F	3	3
SA.MU	SASP Maximum Reset Up	10	∧F	3	5
SA.MD	SASP Maximum Reset Down	–10	∧F	–3	–5
MP.MX	Econ Min at Max Fanspeed	30	%	30	30
PE1.C	Power Exhaust Stage 1 CFM	600	cfm	600	600
IDF.C	Indoor Fan Max Speed CFM	1600 (05) 2000 (06)	cfm	1600 (05) 2000 (06)	1600 (05) 2000 (06)

Relative Humidity Sensor Control

For units with the economizer option (with the ECB-economizer control board), the humidity sensor input is provided on the field connection terminal board. The sensor can be used in addition to or instead of a humidistat. The RH Sensor on OAQ Input configuration, ***Configuration→UNIT→RH.S=YES***, identifies that the sensor is being used instead of an OAQ sensor. Terminal 1 is the 24vdc loop power and Terminal 4 is the 4-20 mA signal input. Refer to the Field Installed Accessories for more information.

CCN Communication

Configure ***Configuration→CCN→CCN.A*** to desired element number (Default is 1). Configure ***Configuration→CCN→ CCN.B*** to desired bus number (Default is 0). Configure ***Configuration→CCN→BAUD*** to desired code number for baud rate (Default is 3 = 9600 baud).

Accessories

Below are quick configuration settings for field installed accessories. If these accessories were installed by the factory, they will already be configured. See the Field-Installed Accessories section, third party control, control connection tables, and CCN or Display parameter tables for any accessories not mentioned below and any additional information on accessories.

Economizer

If an Economizer accessory was field installed, the unit must be configured for it by setting ***Configuration→ECON→EC.EN*** to YES. The default settings for the other economizer configurations should be satisfactory. If they need to be changed, additional information about these configuration settings can be found in the Economizer section.

Power Exhaust

If a Power Exhaust accessory was field installed, the unit must be configured for it by setting ***Configuration→ECON→PE.EN*** to ENBL. The default settings for the other power exhaust configurations should be satisfactory. If they need to be changed, additional information about these configurations can be found in the Power Exhaust section.

Electric Heat

If an Electric Heat accessory was field installed, the unit must be configured for it by setting ***Configuration→HEAT→HT.TY*** to a value of 2. The number of electric heat stages must be configured by setting ***Configuration→HEAT→N.HTR*** per the installed heater.

Fire Shutdown

If a Fire Shutdown or Smoke Detector accessory was field installed, the unit must be configured for it by setting ***Configuration→UNIT→FS.SW*** to normally open (1) or normally closed (2) when there is not a fire alarm. Normally open (1) is the preferred configuration.

IMPORTANT: On standard units, the fire shutdown input is the terminals Fire Shutdown 1 and 2.

Outdoor Enthalpy

If an Outdoor Enthalpy accessory was field installed, the unit must be configured for it by setting ***Configuration→ECON→EN.SW***, identifies the normally open or normally closed status of this input when the outdoor enthalpy is low.

IAQ Switch

If an IAQ Switch accessory was field installed, the unit must be configured for it by setting ***Configuration→AIR.Q→II.CF***, identifies the normally open or normally closed status of this input when the indoor air quality value is low (good) and also selects the unit response to this input.

IMPORTANT: An IAQ switch cannot be used if an enthalpy switch is already on this input.

IAQ Sensor

If an CO_2 Sensor accessory was field installed, the unit must be configured for it by setting ***Configuration→AIR.Q→IA.CF*** selects the unit response to this input. Default conversion to 0 to 2000 ppm.

OAQ Sensor

If an Outdoor Air Quality Sensor accessory was field installed, the unit must be configured for it by setting ***Configuration→AIR.Q →OA.CF*** selects the unit response to this input. Default conversion to 0 to 2000 ppm.

Fan Status

If a Fan Status accessory was field installed, the unit must be configured for it by setting ***Configuration→UNIT→FN.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration.

IMPORTANT: Fan Status input is not on the terminals marked Fan Status.

Filter Status

If a Filter Status accessory was field installed, the unit must be configured for it by setting ***Configuration→UNIT→FL.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration.

Programming Operating Schedules

The *Comfort*Link™ controls will accommodate up to eight different schedules (Periods 1 through 8), and each schedule is assigned to the desired days of the week. Each schedule includes an occupied on and off time. As an example, to set an occupied schedule for 8 AM to 5 PM for Monday through Friday, the user would set days Monday through Friday to ON for Period 1. Then the user would configure the Period 1 Occupied From point to 08:00 and the Period 1 Occupied To point to 17:00. To create a different weekend schedule, the user would use Period 2 and set days Saturday and Sunday to ON with the desired Occupied On and Off times. (See Table 4.)

IMPORTANT: By default, the time schedule periods are programmed for 24 hours of occupied operation.

To create a schedule, perform the following procedure:

1. Scroll to the Configuration mode, and select CCN CONFIGURATION (CCN). Scroll down to the Schedule Number (***Configuration→CCN→SCH.O=SCH.N***). If password protection has been enabled, the user will be prompted to enter the password before any new data is accepted. ***SCH.N*** has a range of 0 to 99. The default value is 1. A value of 0 is always occupied, and the unit will control to its occupied set points. A value of 1 means the unit will follow a local schedule, and a value of 65 to 99 means it will follow a CCN schedule. Schedules 2-64 are not used as the control only supports one internal/local schedule. If one of the 2-64 schedules is configured, then the control will force the number back to 1. Make sure the value is set to 1 to use a local schedule.
2. Enter the Time Clock mode. Scroll down to the LOCAL TIME SCHEDULE (***SCH.L***) sub-mode, and press ENTER. Period 1 (***PER.1***) will be displayed.
3. Scroll down to the MON.1 point. This point indicates if schedule 1 applies to Monday. Use the ENTER command to go into Edit mode, and use the Up or Down key to change the display to YES or NO. Scroll down through the rest of the days and apply schedule 1 where desired. The schedule can also be applied to a holiday.
4. Configure the beginning of the occupied time period for Period 1 (OCC). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the Up or Down key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
5. Configure the unoccupied time for period 1 (***UNC***). Press ENTER to go into Edit mode, and the first two digits of the 00.00 will start flashing. Use the Up or Down key to display the correct value for hours, in 24-hour (military) time. Press ENTER and hour value is saved and the minutes digits will start flashing. Use the same procedure to display and save the desired minutes value.
6. The first schedule is now complete. If a second schedule is needed, such as for weekends or holidays, scroll down and repeat the entire procedure for period 2 (***PER.2***). If additional schedules are needed, repeat the process for as many as are needed. Eight schedules are provided. See Table 4 for an example of setting the schedule.

Table 4 – Setting an Occupied Time Schedule - Weekdays Only for 7:30 to 22:30

DISPLAY MENU	SUB–SUB MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
TIMECLOCK SCH.L		ENTER			Local Occupancy Schedule	
	PER.1	ENTER	OCC.1		Period Occupied Time	
		ENTER		00.00		Scrolling stops
		ENTER		00.00		Hours Flash
		▲		07.00		Select 7
		ENTER		07.00		Change accepted, minutes flash
		▲		07.30		Select 30
		ENTER		07.30		Change accepted
		ESCAPE	OCC.1	07.30	Period Occupied Time	Item/Value/Units scrolls again
		▼	UNC.1	00.00	Period Unoccupied Time	
		ENTER		00.00		Scrolling stops
		ENTER		00.00		Hours Flash
		▲		22.00		Select 22
		ENTER		22.00		Change accepted, minutes flash
		▲		22.30		Select 30
		ENTER		22.30		Change accepted
		ESCAPE	UNC.1	22.30	Period Unoccupied Time	Item/Value/Units scrolls again
		▼	MON.1	NO	Monday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	MON.1	YES	Monday In Period	Item/Value/Units scrolls again
		▼	TUE.1	NO	Tuesday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	TUE.1	YES	Tuesday In Period	Item/Value/Units scrolls again
		▼	WED.1	NO	Wednesday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	WED.1	YES	Wednesday In Period	Item/Value/Units scrolls again
		▼	THU.1	NO	Thursday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	THU.1	YES	Thursday In Period	Item/Value/Units scrolls again
		▼	FRI.1	NO	Friday In Period	
		ENTER		NO		Scrolling stops
		▲		YES		Select YES
		ENTER		YES		Change accepted
		ESCAPE	FRI.1	YES	Friday In Period	Item/Value/Units scrolls again
		ESCAPE				
		ESCAPE				

SERVICE TEST

The Service Test function can be used to verify proper operation of compressors, heating stages, indoor fan, outdoor fans, power exhaust fans, economizer, crankcase heaters, and the alarm relay. Use of Service Test is recommended at initial system start up and during troubleshooting (See Table 5 for point details).

Service Test mode has the following changes from normal operation:

- Outdoor air temperature limits for cooling circuits, economizer, and heating are ignored. Normal compressor time guards and other staging delays are reduced to 30 seconds or less.
- Circuit alerts are limited to 1 strike (versus 3) before changing to alarm shut down state.
- The status of ALM.N is ignored so all alerts and alarms are broadcast on CCN.
- The words "SERVICE TEST" are inserted into every alarm message.

Service test can only be turned ON/OFF at the unit display. Once turned ON, other entries may be made with the display or through CCN. To turn Service Test on, change the value of TEST to ON. To turn service test off, change the value of TEST to OFF.

IMPORTANT: Service Test mode may be password protected. Refer to Basic Control Usage section for more information. Depending on the unit model, factory-installed options, and field-installed accessories, some of the Service Test functions may not apply.

Independent Outputs

The independent (INDP) submenu is used to change output status for the economizer, power exhaust stages, crankcase heaters, and the alarm relay. These independent outputs can operate simultaneously with other Service Test modes. All outputs return to normal operation when Service Test is turned off. When the economizer is using the factory default Digital Control Type (***Configuration→ECON→E.CTL*** is 1 or 2) then the Economizer Calibration feature may be used to automatically check and reset the economizer actuator range of motion. Refer to the economizer operation section of more details.

IMPORTANT: If a network force is applied to CCN points: ECONOCMD, PE_1, PE_2, or ALMOUT, their respective test mode functions will not be usable. Those forces are at a higher level than test mode; therefore they will still be honored when in test mode.

Fan Test

The fans (FANS) submenu is used to change output status for the indoor fan and outdoor fan stages. The VFD power can be turned on and off via IDF (Supply VFD Power Test). The indoor fan speed test (F.SPD) runs the fan at the desired speed entered. The outdoor fan relay test (OFC.1) only tests the relay for switching between high and low speeds. The actual outdoor fan will not run unless cool test is on. The cooling (COOL) and heating (HEAT) service test outputs are reset to OFF for the fans service test.

Cooling Test

The cooling (COOL) submenu is used to change output status for testing the cooling function. The fans (FANS) and heating (HEAT) service test outputs are reset to OFF for the cooling service test. The digital scroll controller power test (CTLR) turns on and off the compressor controller. The compressor capacity test (CPAC) is used to run the compressor at a desired capacity of 15% to 100%. If a capacity is chosen between 1 and 14, the capacity will be set to 15%. The outdoor fan will turn on to high speed when the compressor capacity is 15% or greater. The indoor fan speed will default to supply fan maximum speed (FS.MX) when the compressor capacity test is first activated. The cool test fan speed (F.SPD) is used to change the fan speed while the compressor is running. All normal cooling alarms and alerts are functional.

IMPORTANT: When charging the unit, both the compressor capacity test and the cool test fan speed should be set to 100%.

Heating Test

The heating (HEAT) submenu is used to change output status for the individual heat stages, gas or electric. The fans (FANS) and cooling (COOL) service test outputs are reset to OFF for the heating service test. Indoor and outdoor fans are controlled normally to maintain proper unit operation. The indoor fan speed will run at the configured max speed FS.MX. All normal heating alarms and alerts are functional.

Table 5 – Service Test Modes and Submodes Directory

DISPLAY MENU/ SUB–MENU/ NAME	EXPANDED NAME	VALUES
SERVICE TEST		
TEST	Field Service Test Mode	On/Off
INDP	Test Independent Outputs	
ECON	Economizer Position Test	0 to 100%
E.CAL	Calibrate Economizer	On/Off
PE.1	Power Exhaust 1 Test	On/Off
PE.2	Power Exhaust 2 Test	On/Off
ALRM	Alarm Relay Test	On/Off
CCH	Crankcase Heat Test	On/Off
FANS SUPPLY	Test Fans	
IDF	VFD Power Test	On/Off
F.SPD	Indoor Fan Speed Test	0 to 100%
OFC.1	Outdoor Fan Relay Test	On/Off
COOL	Test Cooling	
CTLR	Dig Scroll Ctrl Pwr Test	On/Off
CAPC	Compressor Capacity Test	0 to 100%
F.SPD	Cool Test Fan Speed	0 to 100%
HEAT	Test Heating	
HT.1	Heat Stage 1 Test	On/Off
HT.2	Heat Stage 2 Test	On/Off

THIRD PARTY CONTROL

Third party controls may interface with the unit *Comfort*Link™ controls through the connections described below. See other sections of these instructions for more information on the related unit control and configurations.

Remote Occupancy

The remote occupancy input is provided on the field connection terminal board (TB1). The Remote Occupancy Switch configuration, ***Configuration→UNIT→RM.SW,*** identifies the normally open or normally closed status of this input when unoccupied.

- 5 = 24 VAC signal input
- 6 = 24 VAC source for dry contact

Fire Shutdown

The fire shutdown input is provided for unit shutdown in response to a fire alarm or smoke detector. The Fire Shutdown Switch configuration, ***Configuration→UNIT→FS.SW,*** identifies the normally open or normally closed status of this input when there is no fire alarm.

Input at field connection terminal board (TB1)

- Fire Shutdown 1 = 24 VAC source for dry contact
- Fire Shutdown 2 = 24 VAC signal input

Alarm Output

The alarm output is provided on the field connection terminal board (TB1) to indicate a current alarm status. The output will be 24VAC if a current alarm exists.

- C = 24 VAC common
- X = 24 VAC signal output

Economizer Monitoring

On field terminal board (TB1), terminals 8, 9, and 10 can be used to monitor economizer position from a third party control system. See economizer operation section for additional information.

In digital mode (E.CTL = 1 or 2), the economizer commanded position can be read as a 2-10v or 4-20mA signal. TB1-8 and TB1-9 are used as follows:

- To read a 2-10v signal, disconnect the violet wire on TB1-J10-8 and place volt meter device across TB1-8 and TB1-9.
- To read a 4-20mA signal, disconnect the violet wire on TB1-J10-8 and the 500Ω resister at TB1-J10-6. Place amp meter device between TB1-8 and TB1-9.

In analog mode (E.CTL = 3), the economizer position can be read as a 2-10v feedback signal across TB1-10 and TB1-9 at any time.

IMPORTANT: The violet wire and 500Ω resister must be connected at the J10 connector as originally wired to operate the economizer in analog mode.

Economizer Damper Control

For units with the economizer option or accessory and the ECB control board, the damper position can be directly controlled through the IAQ sensor input provided on the field connection terminal board. The IAQ Analog Input configuration, ***Configuration→AIR.Q→IA.CF*** will have to set to 3 (Control Minimum Position). When IA.CF = 3, an external 4 to 20 mA source is used to move the damper 0% to 100% directly.

Terminal 2 = 4-20mA + signal
Terminal 3 = 4-20mA - common

IMPORTANT: In this mode preset minimum positions configurations are not valid. The damper position may exceed the input position to provide economizer cooling and CO_2 sensor input can not be used for DCV control. Refer to the Indoor Air Quality operation section for more information.

CONTROLS OPERATION

Display Configuration

The ***Configuration→DISP*** submenu is used to configure the local display settings.

Metric Display (METR)

This variable is used to change the display from English units to Metric units.

Language Selection (LANG)

This variable is used to change the language of the *Comfort*Link™ display. At this time, only English is available.

Password Enable (PROT)

This variable enables or disables the use of a password. The password is used to restrict use of the control to change configurations.

Service Password (PSWD)

This variable is the 4-digit numeric password that is required if enabled.

Test Display LEDs (TEST)

This is used to test the operation of the *Comfort*Link display.

Unit Configuration

Many configurations that indicate what factory options and/or field accessories are installed and other common operation variables are included in Unit Configuration (***Configuration→UNIT***). These configurations will be set in the factory for factory-installed options (FIOP), and field installed accessories installed will require configuration changes. General unit and fan control configurations are also covered under this Unit Configuration menu.

Start-Up Delay (S.DLY)

This configuration sets the control start-up delay after the power is interrupted. This can be used to stagger the start-up of multiple units.

Fan On When Occupied (OC.FN)

A YES value will operate the indoor fan whenever the unit is in the Occupied mode. A NO value will operate the indoor fan only when heating or cooling is necessary. The factory default value is YES.

Shut Down on IDF Failure (IDF.F)

This configuration applies only if a fan switch is installed and configured. A YES value will enable diagnostic Alert T409 to shut down the unit when incorrect fan status is sensed. A NO value will still permit Alert T409 but will not cause unit shutdown. The factory default value is YES.

Supply Fan Maximum Speed (FS.MX)

This configuration sets the limit for the highest speed the fan can run out of 100%. This max speed limit applies to the unit at all times except for fan test.

Supply Fan Minimum Speed (FS.MN)

This configuration sets the limit for the lowest speed the fan can run out of 100%. This minimum speed limit applies to the unit during cooling mode and cooling test.

Vent Mode Fan Speed (FS.VM)

This configuration sets the speed the fan will run during the ventilation mode. The fan speed does not vary during ventilation so it will remain at this speed throughout vent mode.

Fan Status Switch (FN.SW)

This configuration identifies if a fan status switch is installed, and what status (normally open, normally closed) the input is when the indoor fan is OFF.

Filter Status Switch (FL.SW)

This configuration identifies if a filter status switch is installed, and what status (normally open, normally closed) the input is when the filter is CLEAN.

Fire Shutdown Switch (FS.SW)

This configuration identifies if a fire shutdown switch is installed, and what status (normally open, normally closed) the input is when the fire or smoke alarm is OFF (no alarm).

Remote Occupancy Switch (RM.SW)

This configuration identifies if a remote occupancy switch is installed, and what status (normally open, normally closed) the input is when UNOCCUPIED.

RH Sensor On OAQ Input (RH.S)

This configuration identifies if a space relative humidity sensor is installed on the outdoor air quality (OAQ) input. A YES value enables ***SP.RH*** display. A NO value disables SP.RH display and use.

Space Humidity Switch (RH.SW)

This configuration identifies if a space relative humidity switch is installed on the ENTHALPY input, and what status (normally open, normally closed) the input is when the space humidity is LOW.

Temperature Compensated Start Cooling Factor (TCS.C)

This factor is used in the equation of the Temperature Compensated Start Time Bias for cooling. A setting of 0 minutes indicates Temperature Compensated Start in Cooling is not permitted.

Temperature Compensated Start Heating Factor (TCS.H)

This factor is used in the equation of the Temperature Compensated Start Time Bias for heating. A setting of 0 minutes indicates Temperature Compensated Start in Heating is not permitted.

Modes

The *Comfort*Link™ controls operate under a hierarchy of command structure as defined by four main elements: the System Mode, the HVAC Mode, the Occupied status, and the Unit Control Type.

The System Mode is the top level that defines three main states of the control system: Disabled, Enabled, or Test.

The HVAC Mode is the next level that defines four main states of functional operation: Disabled, Fan Only, Cool, and Heat.

The Occupied status affects set points for cooling and heating in Space Sensor control mode and operation of the economizer for indoor air quality ventilation and free cooling.

The general operating mode of the control and the status of some related operation lockouts are located on the display at two locations: ***Run Status→ MODE*** and ***Operating Modes→ MODE***.

System Mode (SYS)

In Run Status and Operating Modes, the current system mode is displayed with expandable text. This is an overall state of the unit. Three states are: Unit Operation Disabled, Unit Operation Enabled, or Service Test Enabled.

HVAC Mode (HVAC)

In Run Status and Operating Modes, the current allowed HVAC mode is displayed with expandable text. This is the mode the unit decides to run in based on its inputs. There are four main HVAC modes; cooling has three different expanded texts. These modes are shown below.

HVAC Mode	Expanded Text	Brief Description
Disabled	HVAC Operation Disabled	Unit is in test mode or System mode is disabled
Fan Only	Ventilation (fan–only)	Fan may run for ventilation
Cooling	Cooling	Mechanical cooling
	Free Cooling	Only economizer used for cooling
	Unoccupied Free Cooling	Only economizer use for cooling (occupied cooling set point active)
Heating	Heating	Heating mode

Remote HVAC Mode Disabled (HV.DN)

Allow disabling of HVAC mode. This is only available on a network connection and shows if the unit has been forced into the disabled status.

Cool Setpoint in Effect (EFF.C)

This shows the actual setpoint that is being used for control during cooling mode.

Heat Setpoint in Effect (EFF.H)

This shows the actual setpoint that is being used for control during heating mode.

Currently Occupied (OCC)

Displays the current state of assumed space occupancy based on unit configuration and inputs.

Timed Override in Effect (T.OVR)

Displays if the state of occupancy is currently occupied due to an override.

Linkage Active (LINK)

Displays if Linkage communication is established between the unit and a Linkage source.

IMPORTANT: The 48/50PD unit only supports the Gen III TEMP Monitor Thermostat.

Demand Limit in Effect (D.LMT)

Displays if a demand limit has been placed on the unit's capacity.

Compressor OAT Lockout (C.LOC)

Displays if one or more refrigerant circuits operation is prevented due to outdoor temperature limit lockout.

Heat OAT Lockout (H.LOC)

Displays if heating operation is prevented due to outdoor temperature limit lockout.

Ok to Use Economizer? (OK.EC)

Displays if the economizer is available for use during cooling. See economizer section for details on this point.

General Operation

48/50PD units can provide cooling, dehumidification, heating, and ventilation operation. Each unit will operate under space temperature sensor control. There are many inputs, configurations, safety factors, and conditions that ultimately control the unit. Refer to the specific operation sections for detail on a specific unit operation.

The unit will try to maintain the Space Temperature (***Temperatures →AIR.T→SPT***) between the effective cool and heat setpoints (***Run Status→MODE→EFF.C and EFF.H***). However, to minimize unnecessary cool to heat and heat to cool changes, there is a 10 minute delay after the last stage turns off before the control will switch modes and a 1 minute delay when re-entering the last mode. The cooling and heating Mode Select Timeguard (***Operating Modes→COOL→MS.TG***) and (***Operating Modes →HEAT→MS.TG***) show the remaining time before allowing the respective mode to be entered.

Setpoint Determination

Setpoints are used to control the unit. The Cool Setpoint in Effect (EFF.C) and the Heat Setpoint in Effect (EFF.H) are the points in which the unit is controlling to at a specific time. These points are read only points and change according to occupancy, the offset slider status, and network writes.

If the building is in occupied mode, the Occupied Cool Setpoint (***Setpoints→OCSP***) and the Occupied Heat Setpoint (***Setpoints →OHSP***) are active. When the building is in unoccupied mode, the Unoccupied Cool Setpoint (***Setpoints→UCSP***) and the Unoccupied Heat Setpoint (***Setpoints→UHSP***) are active. The heating and cooling set points are also separated by a Heat-Cool Set Point Gap (***Setpoints→GAP***) that is user configurable from 2 to 10 degrees F. This parameter will not allow the setpoints to be set too close together, it will change the last setpoint adjusted if it is set within the GAP.

When the space sensor has a setpoint slider adjustment, the cool and heat setpoints (occupied) can be offset by sliding the bar from one side to the other. The SPT Offset Range (+/-) (***Setpoints →STO.R***) sets the total positive or negative degrees that can be added to the setpoints. With the slider in the middle, no offset is applied. Moving the slider to the "COOL" side will subtract from each setpoint, and sliding it to the "WARM" side will add to the setpoints. The slider offset being applied at any given time is displayed as Space Temperature Offset (***Temperatures→AIR.T →SPTO***).

Occupancy Determination

The building's occupancy is affected by a number of different factors. Occupancy affects the unit set points and the operation of the economizer. The factors affecting occupancy are listed below from highest to lowest priority.

Level 1 Priority

Level 1 classification is a force/write to occupancy and can occur three ways. Listed in order of priority: force on OCCUPIED, a write to NVI_OCC, and a Linkage write. The CCN point OCCUPIED is forced via an external device such as a ComfortID™ controller or a service tool. When OCCUPIED is forced to YES, the unit is considered occupied; when OCCUPIED is forced to NO, the unit is considered unoccupied. If the 3rd party protocol LON is writing to NVI_OCC, the control maps it to OCCUPIED as an input. If the unit is being controlled by Linkage, the occupancy is communicated and mapped to OCCUPIED as an input. LON and Linkage do not force the point, only write to it, therefore a force applied to OCCUPIED will override them.

If OCCUPIED is not being forced or written to, proceed to the level 2 priority.

Level 2 Priority

Remote Occupancy Switch should be configured to either Normally Open or Normally Closed when the user would like to control the occupancy with an external switch. This switch is field-supplied (24v, single pole, single throw [SPST]). There are three possible configurations for the remote occupancy switch:

1. (***Configuration→UNIT→RM.SW = 0***) No Switch
2. (***Configuration→UNIT→RM.SW = 1***) Normally Open Switch
3. (***Configuration→UNIT→RM.SW = 2***) Normally Closed Switch

If the switch is configured to No Switch (0), the switch input value will be ignored and software will proceed to level 3 priority. For each type of switch, the appropriate configuration and states are listed in the table below.

TYPE OF SWITCH	SWITCH CONFIGURATION	STATE OF SWITCH AND STATE OF OCCUPANCY
Occupied When Closed or Unoccupied When Open	Normal Open (1)	Open and Unoccupied
		Closed and Occupied
Occupied When Open or Unoccupied When Closed	Normal Closed (2)	Open and Occupied
		Closed and Unoccupied

NOTE: To perform remote occupancy, an Economizer Control Board must be installed in the unit.

Level 3 Priority

The following occupancy options are determined by the state of Occupancy Schedule Number (***Configuration→CCN→SCH.O →SCH.N***) and the Global Schedule Broadcast (***Configuration →CCN→ BROD→B.GS***).

1. (***Configuration→CCN→SCH.O→SCH.N = 0***) The unit is always considered occupied and the programmed schedule is ignored. This is the factory default.
2. (***Configuration→CCN→SCH.O→SCH.N = 1-64***) Follow the local programmed schedule. Schedules 1 to 64 are local within the controller. The unit can only store one local schedule and therefore changing this number only changes the title of the schedule table.
3. (***Configuration→CCN→SCH.O→SCH.N = 65-99***) Follow the global programmed schedule. If the unit is configured as a Global Schedule Broadcaster (***Configuration→CCN→BROD→B.GS = YES***), the unit will follow the unit's programmed schedule and broadcast the schedule so that other devices programmed to follow this schedule number can receive the schedule. If the unit is not programmed as a Global Schedule Broadcaster (***Configuration→CCN→BROD→B.GS = NO***), the unit will receive broadcasted schedules from a unit programmed to broadcast this schedule number. While using the programmed schedule, occupancy can be temporarily switched from unoccupied to occupied by pressing the override button for approximately 3 seconds on the T-55, T-56, T-58 or T-59 space temperature sensor. Override will only occur if SPT Override Enabled (***Configuration →CCN→SCH.O→OV.SP***) is set to YES. The length of the override period when pressing the override button is determined by the Override Time Limit (***Configuration →CCN→SCH.O→OV.TL***). The hours remaining in override are displayed as Timed Override Hours (***Configuration→CCN→SCH.O→OV.EX***). This point can also be changed from the local display or network to set or change the override period length.

Indoor Fan Operation

The indoor fan is controlled by the Indoor Fan VFD Power Relay (***Outputs→FANS→IDF***) on the MBB (main base board) control, which then operates the indoor fan contactor (IFC). The Indoor Fan VFD Power Relay (IDF) is always on when the unit is powered up so that power is supplied to the VFD electronic boards. This is unless the unit is put in test mode or if the System Mode (SYS) status is disabled. If configured for fan status switch (FN.SW) and Shut Down on IDF Failure (***Configuration→UNIT →IDF.F = Yes***) is enabled, the fan status can shutdown the VFD.

The Commanded Fan Speed (***Outputs→FANS→F.SPD***) represents the controls commanded speed for the fan at any given time. This commanded speed is determined by the unit's current HVAC mode and the FAN ON When Occupied (***Configuration →UNIT→OC.FN***) configuration. If the indoor fan is configured for occupied fan (OC.FN = Yes), the fan speed is not allowed to drop to 0 while the unit is occupied. If there is not a cooling or heating demand for the fan, its commanded speed will be at the Vent Mode Fan Speed (***Configuration→UNIT→FS.VM***). If the indoor fan is configured for intermittent fan (OC.FN = No), the fan speed (F.SPD) will be greater then 0 when there is a cooling, heating, dehumidification, or air quality demand. During the unoccupied period, the fan will always operate intermittent. With intermittent fan, the speed will drop to 0 after a configurable time delay with respect to the HVAC mode that is ending. The Fan-off Delay delays are as follows: Mech Cool (***Configuration→COOL →FOD.C***), Elect Heat (***Configuration→HEAT→FOD.E***), and Gas Heat (***Configuration→HEAT→FOD.G***). The fan will override to remain on at last commanded speed if compressors or heat relays are ever stuck on. If configured for IAQ fan operation, the fan will run at the Vent Mode Fan Speed (FS.VM) to satisfy air quality demands. See the Indoor Air Quality section if using IAQ (indoor air quality) accessory sensors.

When the unit is in heating mode (gas heat or electric heat mode) the indoor fan will operate at the Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***) setting. For gas heating units, the IGC control fan output is also monitored by the MBB control. This can result in additional modification of fan delays or other operation due to safety functions of the IGC control.

When the unit is in cooling or unoccupied free cooling mode, the supply fan will modulate between the configured Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***) and the Supply Fan Minimum Speed (***Configuration→UNIT→FS.MN***) to maintain the space temperature sensor set point. This modulation is based on the space temperature trend and the cooling demand trend. The fan will attempt to control the space by modulating under normal operating conditions and dehumidification reset. Cooling reset will occur when the fan is locked at max or min speed. Refer to Cooling operation for more information on fan operation during cooling.

Cooling Operation

The 48/50PD unit's cooling operation consists of: demand and mode determination, capacity request to satisfy the demand, and handling a request with the unit's resources. These resources include a variable speed fan, compressor, and an economizer (if installed). This section covers cooling fan speed operation, mechanical cooling, and dehumidification. For economizer cooling and operation, refer to the Economizer section. The unit enters a cooling mode based on a demand, then tries to find a steady state to run to balance the space's load. If the demand changes or the unit satisfies the cooling demand, the cooling mode will end.

Cooling Mode

The cooling HVAC mode (***Run Status→MODE→HVAC=3***) has two different expandable texts: Cooling and Unoccupied Free Cooling. These are part of the general cooling mode and resemble the specific type of cooling that is being performed at any given time. The expanded text is for user reference only. The control will display if it is ok to select the cooling mode (***Operating Modes →COOL→OK.CL= Yes***). For the unit to enter cooling mode, four things must be true: the indoor fan must be ok to use, the mode changeover time guard must be expired, the unit must have a valid space temperature or valid supply air temperature, and there must be a cooling or dehumidification demand. The unit will remain in cooling for at least one minute and until the cool demand drops below -0.5°F for 5 minutes or if any of the above conditions turn false. If only a dehumidification demand exists and the heat demand becomes greater then -1°F, the unit will end cooling. The cooling mode can not officially end until the compressor is off.

Cooling Control

Once the unit is in a cooling mode, it must decide what the demand is and how to handle it. The unit will modulate the indoor fan speed to supply more or less airflow to the space at the current Supply Air Temperature (***Temperatures→AIR.T→SAT***) based on the effective cool setpoint (EFF.C). The compressor will modulate to maintain a specific SAT based on the Cool Supply Air Set Point (***Setpoint→SASP***). If an economizer is installed and can be used for cooling, the unit will use it first (see economizer section for its operation). If the economizer can not be used or additional cooling is needed, a mechanical cooling check is performed. OK to use Compressor? (***Operating Modes→COOL→OK.MC***), will be set to yes when the compressor is enabled and not locked out. The Compressor Lockout Temp (***Configuration→COOL→C.LO***) configuration tells the unit what outside temperature and above that the compressor is allowed to run. Compressor OAT Lockout (***Run Status→MODE→C.LOC***) displays yes when the outdoor temperature is too low for compressor operation.

The Fan Speed Control Demand (***Configuration→COOL →FS.CD***) configuration sets the fan operation window. When the temperature in the conditioned space is higher than the effective cool setpoint (EFF.C) plus the Fan Speed Control Demand (FS.CD), the indoor fan will run at 100%. When the temperature in the conditioned space is between the effective cool setpoint (EFF.C) and the effective cool setpoint (EFF.C) plus the Fan Speed Control Demand (FS.CD), the indoor fan will modulate on a curve to maintain the effective cool setpoint (EFF.C). (See Fig. 6.) This modulation is based on the space temperature trend and the cooling demand trend. The space temperature trend is displayed as Spacetemp Trend (***Operating Modes→COOL→SPT→TRND***). The cooling demand trend is the rate of change of Cooling Demand (***Run Status→COOL→DMD.C***). (See Fig. 6.)

The Compressor requested cooling capacity (***Operating Modes →COOL→REQ.C***) is determined by a Proportional Integral Derivative (PID) algorithm that controls the Supply Air Temperature to the Supply Air Control Point (***Run Status→COOL →SA.CP***) based on the Supply Air Temp Demand (***Operating Modes→COOL→SA.DM***). This demand is the difference between the actual supply temperature and the current control point. The current control point Supply Air Control Point (SA.CP) is the result of adding the Cool Supply Air Setpoint (SASP), the Cool Demand SASP Reset (***Run Status→COOL→SR.CD***), and the Dehumidifying SASP Reset (***Run Status→COOL→SR.RH***).

Reset is a cooling function that adjusts the supply air setpoint to allow cooler or warmer supply air than what the supply air setpoint (SASP) is set for. Cool reset is needed when the fan speed cannot maintain the space temperature with the current supply air temperature within a reasonable time. After the fan reaches its maximum speed (FS.MX) or its minimum speed (FS.MN) for 2 minutes, cool reset can then start to be applied. The amount of cool reset is determined by the cooling demand (DMD.C) and will change to follow a curve based on the Spacetemp Trend (TRND).

Cool Demand SASP Reset (***Run Status→COOL→SR.CD***) defines the current amount of cool reset applied to the supply air setpoint (SASP) and is limited by two configurations: SASP Maximum Reset Down (***Configuration→COOL→SAT→SA.MD***) and SASP Maximum Reset Up (***Configuration→COOL→SAT →SA.MU***). The SASP Maximum Reset Down (SA.MD) configuration sets how far below the Cool Supply Air Set Point (SASP) the control is allowed to reset. The SASP Maximum Reset Up (SA.MU) configuration sets how far above the Cool Supply Air Set Point (SASP) the control is allowed to reset. If the cooling demand (DMD.C) is less than or equal to Speed Control Demand (FS.CD), the maximum downward reset (SA.MD) will be applied and the fan speed (F.SPD) is then locked at max speed (FS.MX). If the cooling demand (DMD.C) is greater than or equal to negative Speed Control Demand (-FS.CD), the maximum upward reset (SA.MU) will be applied and the fan speed (F.SPD) is then locked at the minimum speed (FS.MN).

When cool reset is no longer needed, the control will start removing the reset until all reset is removed and the Supply Air Control Point (SA.CP) is back to the original Supply Air Set Point (SASP). The indoor fan speed (F.SPD) will then unlock and modulate to maintain the Space Temperature (SPT) along the defined time temperature curve to effective cool setpoiint (EFF.C).

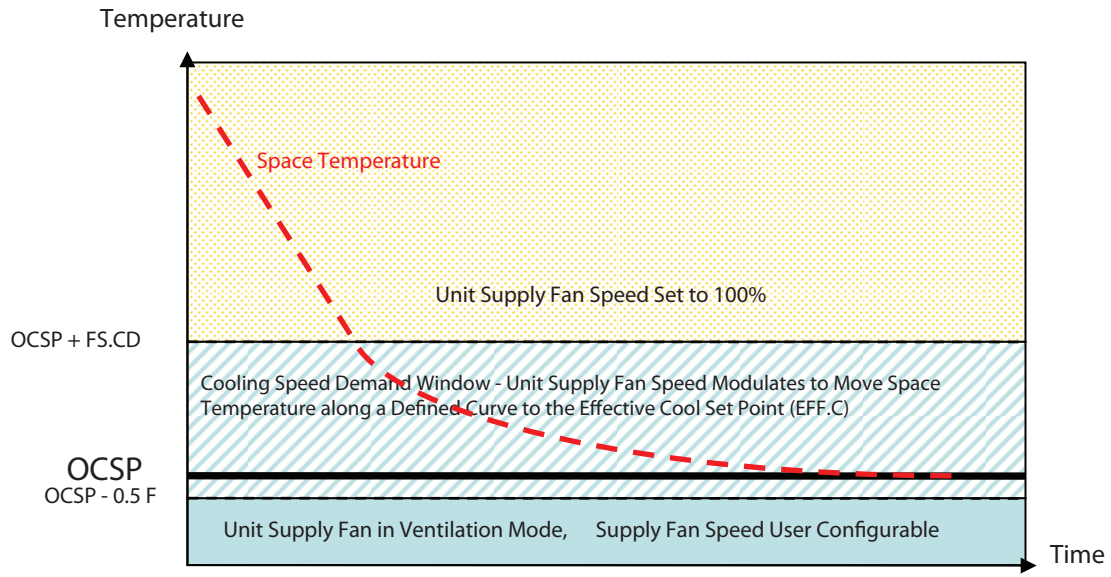

Fig. 6 - Indoor Fan Speed Modulation Curve

Dehumidification Control

Dehumidification operation requires installation and configuration of either a space relative humidity sensor or a relative humidity switch input. Space Humidity Switch (***Configuration→UNIT →RH.SW***) set to 1 for use of a normally open switch or 2 for normally closed switch. The switch is wired to the field connection terminal board terminals R and W2. RH Sensor on OAQ Input (***Configuration→UNIT→RH.S***) set to Yes for use of a 4 to 20 mA output RH sensor wired to field connection terminal board terminals 1 and 4 (for loop powered). RH Sensor Value at 4ma (***Configuration→AIR.Q→H.4M***) sets the % display for a 4mA input from the relative humidity sensor. RH Sensor Value at 20ma (***Configuration→AIR.Q→H.20M***) sets the % display for a 20mA input from the relative humidity sensor.

Dehumidification is a cooling mode function. When using a humidistat or switch input, the demand for dehumidification is seen as Space Humidity Switch (***Inputs→GEN.I→HUM***) being Low or High. A low value means humidity level is good and a high value means that dehumidification is needed. When using an RH sensor, the demand is based on the Space Humidity Sensor (***Inputs→AIR.Q→SP.RH***) value compared to the Space RH Setpoint (***Setpoints→RH.SP***). If the Space Humidity Sensor (SP.RH) value is above the Space RH Setpoint (RH.SP), then dehumidification is needed. If the Space Humidity Sensor (SP.RH) value is below the Space RH Setpoint (RH.SP) minus the Space RH Deadband (***Setpoints→RH.DB***), then dehumidification is no longer needed.

When there is a dehumidification demand, the control will try to satisfy it by resetting the Cool Supply Air Setpoint (***Setpoint →SASP***) downwards. Dehumidifying SASP Reset (***Run Status →COOL→SR.RH***) defines the current amount of dehumidifying reset being applied. Dehumidifying reset can only decrease the cool supply air setpoint (SASP). If the fan speed (F.SPD) was locked at min or max for Cool Demand SASP Reset (SR.CD), it will be unlocked to modulate to control the space temperature and the Cool Demand SASP Reset (SR.CD) will be locked at its current value. The dehumidifying SASP Reset (SR.RH) will increase one degree every 5 minutes until the dehumidification demand is satisfied. Once satisfied, the dehumidifying SASP Reset (SR.RH) will decrease one degree every 3 minutes until it reaches 0. The dehumidifying SASP Reset (SR.RH) is subtracted from the current Supply Air Control Point (***Run Status→COOL→SA.CP***) to create the new Supply Air Control Point (SA.CP).

Compressor Control

The control will try to provide the capacity that is requested, but has some limitations. When the compressor turns on, it must honor a soft start. This limits the capacity to 15% for the first 15 seconds and then allows up to 20 additional percent every 15 seconds for the first minute. The Min Compressor Capacity (***Configuration →COOL→MIN.C***) configuration sets the lowest allowed capacity during normal operation. This minimum can only be violated under three conditions: the soft start for the compressor, low pressure override, or if the economizer is being used for free cooling. There are time guards to protect the compressors, Compressor Min On Time (***Configuration→COOL→MRT.C***) and Compressor Min Off Time (***Configuration→COOL→MOT.C***) apply before a compressor can be turned back on or turned off. Circuit diagnostic tests are performed during operation which may or may not allow a compressor to be used. Compressor A Timeguard (***Run Status→COOL→TG.A***) displays the time the compressor has before it is available for use. Compressor A Feedback (***Run Status→COOL→CMP.A***) is displayed on when the digital scroll controller (DSC) turns on the compressor. The Compressor Capacity (***Outputs→COOL→CAPC***) displays the actual running capacity of the compressor at any given time.

NOTE: The Compressor Minimum Capacity (MIN.C) is configured at the factory to 70%. This is the minimum compressor capacity that gives the highest SEER rating for a 48 series unit with the highest gas heat option and no economizer per AHRI standard 210/240. Since the AHRI rating standard does not account for energy savings that can be realized by displacement ventilation air distribution system and extending economizer cooling operation at higher supply air temperature set points, a complete energy analysis should be conducted before changing the Compressor Minimum Capacity (MIN.C) setting to determine the energy savings at that lower Compressor Minimum Capacity (MIN.C) setting.

Table 6 – Fan Level Control of Outdoor Fan

FAN LEVEL	FAN SPEED	CONDITIONS TO TRANSITION TO NEXT LOWER LEVEL	CONDITIONS TO TRANSITION TO NEXT HIGHER LEVEL
0	OFF	N/A	1. Compressor Contactor is ON (on initial start up outdoor fan runs at Level 2 for 10 seconds before moving to correct level based on outside air temperature or Condenser Pressure A)
1	LOW	1. Compressor Contactor is OFF	1. Outside Air Temperature Control – – Fan Lev2 On Temperature 55°F or above (**Configuration→COOL→OFC→2.ON > =55°F**)* 2. Condenser Pressure A Override – – Fan Lev1 MAX Pressure 450 psig or above (**Configuration→COOL→OFC→1.MXP > =450 psig**)*
2	HIGH	1. Outside Air Temperature Control – – Fan Lev2 Off Temperature 45°F or below (**Configuration→COOL→OFC→2.OFF < =45°F**)* 2. Condenser Pressure A Override – – Fan Lev2 Min Pressure 200 psig or below (**Configuration→COOL→OFC→2.MNP < =200 psig**)*	N/A

Outdoor Fan Control

Each unit has a means for variable outdoor airflow to control condenser pressure control within an acceptable range by responding to varied operating modes and ambient temperatures. This is implemented using multi-speed motors. The outdoor fan contactor (***Outputs→FANS→OFC.1***), is powered on the load side of the compressor contactor so the outdoor fans will run only when the compressor contactor is energized. When the outdoor fan contactor is not energized, its normally closed contacts will run the outdoor fan at high speed. When the outdoor fan contactor is energized, its normally open contacts will close and the outdoor fan runs at low speed.

The outdoor fan speed is controlled by levels. There are 3 levels of operation (0-2) and the current operating level is shown as Outdoor Fan Level (***Operating Modes→COOL→F.LEV***). The fan level selected during operation is based on factory configurations of outdoor temperature limits and condenser pressure limits. These are in the Outdoor Fan Control submenu (***Configuration→COOL→OFC***) and shown in Table 6. The starting level is picked after a compressor is turned on and is based on the Outdoor Air Temperature (***Temperatures→AIR.T→OAT***). The circuit's Saturated Condensing Temperature (***Temperatures →REF.T→SCT.A***) can override the fan level at any time.

NOTE: Factory default configurations account for model differences and should not be changed. The default configurations have been qualified over a large range of conditions and are provided in case a field replacement of a control board occurs and the settings need to be checked or manually configured. Outdoor fan operation is further described below to assist in troubleshooting.

Heating Operation

The 48/50PD unit's heating operation consists of: demand and mode determination, staging request to satisfy the demand, and handling a request with the unit's resources. These resources can be gas heat or electric heat. This section covers both gas heat units and electric heat units. The Type of Heat Installed (***Configuration →HEAT→HT.TY***) configuration will be factory set to 1 for gas units, 2 for electric heat units with heaters installed, and 0 for electric heat units without heat installed. The unit enters a heating mode based on a demand, decides how to satisfy the demand, executes its plan, and then leaves the heating mode.

Heating Mode Control

The heating HVAC mode (***Run Status→MODE→HVAC=4***) represents both types of heating (gas or electric) under all types of control. For the unit to be allowed to enter the heat mode, six things must be true: the indoor fan must be ok to use, the mode changeover time guard must be expired, the unit must have a valid space temperature, heat must be enabled (HT.TY = 1 or 2), the Outdoor Air Temperature (***Temperatures→AIR.T→OAT***) must be less then the Heating Lockout Temp (***Configuration→HEAT →HT.LO***) and there must be a heating demand. Heat OAT Lockout (***Run Status→MODE→H.LOC***) displays when heat is locked out on outdoor temperature and therefore can not allow heat mode. The control will display if it is ok to select the heating mode (***Operating Modes→HEAT →OK.HT= Yes***). The unit will remain in heating for at least one minute and until the demand is dropped or if any of the above conditions turn false. The heating mode can not officially end until all heat stages are off and the IGC fan request is dropped.

Supply-Air Temperature Sensor (SAT)

The SAT Heat Mode Sensing (***Configuration →HEAT→SAT→SAT.H***) informs the unit that the supply air sensor has been relocated downstream of the heat section. This configuration affects the Supply Air Temperature (***Temperatures →AIR.T→SAT***) value displayed as listed below.

When SAT.H = DSBL, the Supply Air Temperature (***Temperatures →AIR.T→SAT***) value on the Scrolling Marquee and the CCN tables will be forced to zero when heat outputs come ON and for 5 minutes after. The default Supply Air Temperature location is at the fan inlet, upstream of the heat section.

When SAT.H = ENBL, the Supply Air Temperature (***Temperatures →AIR.T→SAT***) sensor reading is displayed at the Scrolling Marquee and the CCN tables during heating mode. This setting should only be used if the original SAT sensor wires are removed from the Main Base Board (MBB) and replaced by an accessory SAT sensor located in the supply duct downstream of the heat section. There are then two supply air temperature limits that become active, the Maximum SAT Lower Level (***Configuration →HEAT→SAT→SAM.L***) the Maximum SAT Upper Level (***Configuration→HEAT→SAT→SAM.U***). Any time the supply air temperature rises above SAM.L, the heat staging will be limited to what is currently on and no additional stages can be added until the supply air temperature falls back below SAM.L. If the supply air temperature rises above SAM.U, then heating will be reduced by removing a heat stage. That stage can not be added again until the Supply Air Temperature falls below SAM.L. If the supply air temperature stays above SAM.U, then another stage will be removed after the Heat Stage Decrease Time (***Configuration →HEAT→H.DEC***). If SAM.L and SAM.U are configured so that they are close together, the last stage of heat might cycle rapidly, slowed only by its minimum on and off-time requirements.

Staging Control

Once the unit is in a heating mode, it must decide what the demand is and how to satisfy. Requested Heating Stages (***Run Status →HEAT→REQ.H***) will be determined then passed to heat control to actually add the heating stages.

Heat staging control is an adaptive anticipation control that weighs the actual demand against the trend of that space. It also honors stage time guards and supply air limits. The demand for heating in the space is displayed as the Heating Demand (***Run Status →HEAT→DMD.H***). The control tries to anticipate the change in the space because of its current stage status. This anticipation is based on the Spacetemp Trend (***Operating Modes→HEAT →SPT→TRND***). This trend will show the control how the space is reacting to the current running conditions and help it decide when to add or remove one stage from the requested stages. The Heat Stage Increase Time (***Configuration→HEAT→H.INC***) or the Heat Stage Decrease Time (***Configuration→HEAT→H.DEC***) has to expire before another stage can be added or a stage can be subtracted. If at any time the Supply-Air Temperature (SAT) falls below the Maximum Supply Air Temperature Lower Level (***Configuration→HEAT→SAT→SAM.L***), the requested stages will not be allowed to increase. If at any time the SAT falls below the Maximum Supply Air Temperature Upper Level (***Configuration→HEAT→SAT→SAM.U***), the requested stages will be reduced by one without honoring H.DEC.

Heat Relay Control

The heat relay control is responsible for energizing or de-energizing the heat stage relays and works hand and hand with the staging control. As the staging control requests stages, the heat relay control determines what actual heat relays are available or energized and tries to provide stages for what is requested. The availability of a heat relay depends on the heat installed, how many stages, and time guards. The type of Heat Installed (***Configuration→HEAT→HT.TY***) must be set for gas or electric for any stages to be available. The Number of Heat Stages (***Configuration→HEAT→N.HTR***) configuration tells the control how many heat relays can be used. Heat Stage 1 Timeguard (***Run Status→HEAT→TG.H1***) and Heat Stage 2 Timeguard (***Run Status→HEAT→TG.H2***) display the time a respective heat relay has before it is available for use.

The available stages at any given time are displayed as Available Heating Stages (***Run Status→HEAT→AVL.H***). The actual heat relays on at any given time are displayed as Actual Heating Stages (***Operating Modes→HEAT→ACT.H***). Heat Stage 1 Relay (***Run Status→HEAT→HT.1***) and Heat Stage 2 Relay (***Run Status →HEAT→HT.2***) are displayed on when the respective relay is energized. There are time guards to protect from short cycling, Heat Minimum On Time (***Configuration→HEAT→MRT.H***) and Heat Minimum Off Time (***Configuration→HEAT→MOT.H***) apply before a heat relay can be turned back on or turned off.

Integrated Gas Controller (IGC)

The heat staging is determined as described above and the Integrated Gas Controller (IGC) initiates the gas heat module start-up. The Integrated Gas Controller (IGC) minimum on-time of 1 minute will be followed even if Heat Minimum On Time (***Configuration→HEAT→MRT.H***) is lower and during Service Test. If the IGC temperature limit switch opens within 10 minutes of the end of the gas heat cycle, the next fan off delay will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified by the IGC, the fan off delay will not change back to the configured Fan-off Delay, Gas Heat (***Configuration→HEAT →FOD.G***) unless power is reset to the control. A light emitting diode (LED) is provided on the IGC to indicate status. During normal operation the LED is continuously on. See the Troubleshooting section if the LED is off or flashing. The IGC is located behind the gas section access panel door.

When the control energizes Heat Stage 1 Relay (***Run Status →HEAT→HT.1***), power is sent to the W terminal on the IGC board. A check is made to ensure that the rollout switch and limit switch are closed. The induced-draft motor is then energized, and when speed is proven with the Hall Effect sensor on the motor, the ignition activation period begins. The burners will ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt. If the burners still do not light, this sequence is repeated for 15 minutes. After the 15 minutes have elapsed, if the burners still have not lit, heating is locked out. The control will reset when the request for heat is temporarily removed. When ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, limit switches, the Hall Effect sensor, as well as the flame sensor. If the unit is set for fan auto, 45 seconds after ignition occurs the indoor-fan motor will be energized (and the outdoor-air dampers will open to their minimum position). If for some reason the over temperature limit opens prior to the start of the indoor fan blower, on the next attempt, the 45-second delay will be shortened to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan on delay will not change back to 45 seconds unless power is reset to the control. When the control energizes Heat Stage 2 Relay (***Run Status→HEAT→HT.2***), power is supplied to the second stage of the main gas valve. If both stage 1 and stage 2 of the gas valve close, gas will be turned off to the main burners.

Economizer Operation

If an economizer is installed, then Economizer Installed (***Configuration→UNIT→EC.EN***) should be set to YES. The economizer damper is controlled by the Econo Commanded Position (***Outputs→ECON→EC.CP***) on the Economizer Control Board (ECB). Feed back from the economizer actuator is output to the ECB and is displayed as Econo Actual Position (***Outputs →ECON→EC.AP***). The Economizer is used for ventilation, cooling and to control the power exhaust. If the Indoor fan is not on, the economizer will not operate.

Economizer Actuator Communication

The economizer actuator used with the 48/50PD units is a Multi-Function Technology (MFT) actuator. This allows the ComfortLink system to communicate with the actuator digitally using Belimo MP protocol. The configuration Economizer Control Type (***Configuration→ECON→E.CTL***) determines the communication method, either digital or analog, used to communicate between the Economizer Control Board and the economizer actuator.

NOTE: The power to the unit must be cycled after the Economizer Control Type (***Configuration→ECON→E.CTL***) configuration parameter is changed.

E.CTL = 1 or 2 (Digital/Position or Digital/Command)

When Economizer Control Type (***Configuration→ECON →E.CTL***) is set to 1, the Economizer Control Board will communicate with the economizer actuator using the digital protocol, from Economizer Control Board plug J7-1 to actuator pin 5. The commanded position and the actuators actual position are communicated back and forth between the actuator and the Economizer Control Board. When the Economizer Control Board and actuator first initiate communication, a Control Angle (***Operating Modes→ECON→C.ANG***) is provided to the Economizer Control Board and defines the actuator's range of motion. The control angle must be greater than the Min Actuator Ctrl Angle (***Configuration→ECON→M.ANG***). During this digital control, the Economizer Control Board analog 4 to 20 mA output will represent the actuator's actual position when E.CTL = 1 or commanded position when E.CTL =2. Because the wiring has a built-in 500-ohm resistor, the 4 to 20mA signal is converted to a 2 to 10VDC signal that is accessible via the field connected terminal board TB-8 and TB-9. However, before this signal can be read remotely, the violet wire that connects the actuator to field connection terminal board TB-J10-8 must be removed or cut.

E.CTL = 3 (Analog Control)

When E.CTL is set to 3, the Economizer Control Board will NOT communicate with the actuator using digital MFT. It will instead control the economizer actuator directly with the 4 to 20mA analog signal wired to TB-8 and TB-9 along with the 500-ohm resistor producing a 2 to 10VDC signal for the actuator. While in this mode, the actuator's built-in 2 to 10VDC feedback signal is accessible via TB-9 and TB-10 any time because it is not used by the Economizer Control Board.

Minimum Ventilation

The economizer will open to allow ventilation when the indoor fan is turned on and the unit is in the occupied state. The economizer damper position at any given time for ventilation is displayed as the Min Position in Effect (***Run Status→ECON→EC.MP***). This minimum position can be effected by the indoor fan speed (F.SPD) and indoor air quality. To maintain a constant airflow through the economizer, as the indoor fan speed decreases or increases, the damper minimum position will increase or decrease, respectively. This relationship curve is shown in Fig. 7.

These units can also be equipped with optional CO_2 sensors for additional indoor air quality control. When unit is equipped with a return duct CO_2 sensor or return duct CO_2 sensor and outside air CO_2 sensor the Economizer minimum position vs. fan speed curve will be recalculated based on the CO_2 level of the return and/or outside air as shown in Fig. 7. When the Commanded Fan Speed (F.SPD) is between Supply Fan Maximum Speed (FS.MX) and the Supply Fan Minimum Speed (FS.MN) the damper will operate in the shaded area of Fig. 7 based on the IAQ Level (IAQ). See the Indoor Air Quality (IAQ) section for more details on Demand Control Ventilation (DCV).

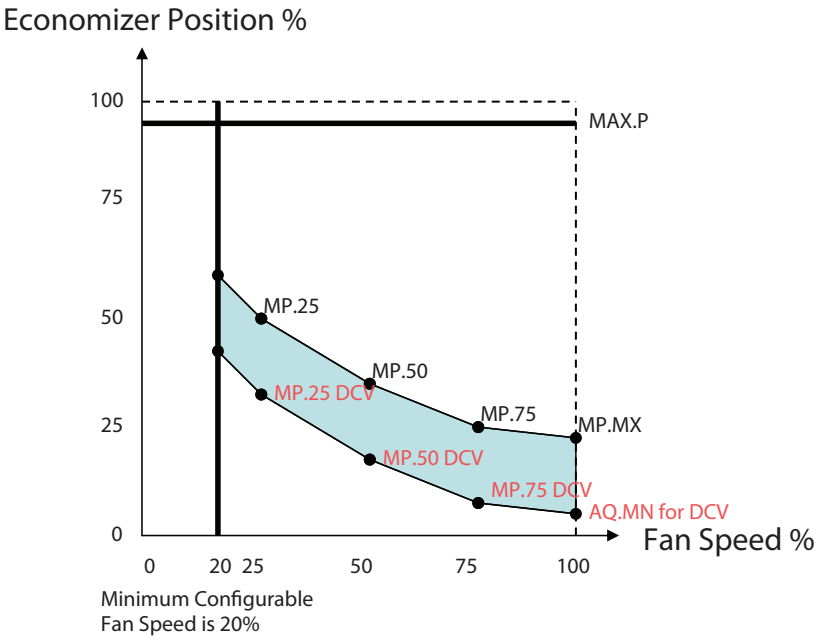

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Fig. 7 - Minimum Damper Position Curve

The shape of the Economizer Minimum Position vs. Fan Speed curve is determined by the configuration parameters: Econ Min at 25% Fan speed (***Configuration→ECON→MP.25***), Econ Min at 50% Fan speed (***Configuration→ECON→MP.50***), Econ Min at 75% Fan speed (***Configuration→ECON→MP.75***) and Econ Min at Max Fan speed (***Configuration→ECON→MP.MX***). These configurations are preset at the factory for default purposes. The Econ Min at Max Fan Speed (MP.MX) should be changed based on the air balance of the unit for proper ventilation. The Econ Min at 25% Fan speed (MP.25), Econ Min at 50% Fan speed (MP.50) and Econ Min at 75% Fan speed (MP.75) damper positions will be calculated and changed automatically after changing the Econ Min at Max Fan Speed (MP.MX) and Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***).

The damper position curve can be field adjusted per application, if needed. The Econ Min at 25% Fan speed (***Configuration →ECON→MP.25***), Econ Min at 50% Fan speed (***Configuration →ECON→MP.50***) and Econ Min at 75% Fan speed (***Configuration→ECON→MP.75***) damper position are user configurable and can be determined by setting the fan speed at 25, 50 and 75% and determining the damper position required to maintain the Econ Min at Max Fan Speed (***Configuration →ECON→MP.MX***) outside air CFM through the economizer outside air dampers. The default calculations programmed into the PD controls are based on a side shot economizer at 400 CFM/TON Supply Air flow with negative 0.25 in H2O pressure in the return duct. Econ Min at Max Fan Speed (FS.MN) is set by user based on minimum required outside air ventilation CFM required for the application. This procedure would be the same as if this were a CV unit with the unit running at the design point CFM. This determines the minimum position amount of outside air CFM required when the fan is running at maximum speed. See the Evaporator Fan Set-up section under start-up for more information.

Free Cooling

The economizer will be allowed to help with cooling (***Run Status →MODE→OK.EC = Yes***) if the supply air temperature sensor reading is valid, there are no applied lockouts, and there is not a dehumidification demand. There are four economizer lockouts that can be applied at any time. Econo Cool OAT Lockout (***Operating Modes→ECON→E.LOC***) occurs when the Outdoor Air Temperature (OAT) is greater than the configured Econo Cool Hi Temp Limit (***Configuration→ECON→EH.LO***) or less than the configured Econo Cool Lo Temp Limit (***Configuration→ECON →EL.LO***). Econo Diff DBulb Lockout (***Operating Modes→ ECON→D.LOC***) occurs when Diff Dry Bulb Control is enabled (***Configuration→ECON→DF.DB = Enable***) and the return air temperature (RAT) is lower then the outdoor air temperature (OAT). Econo Cool Enth Lockout (***Operating Modes→ECON →EN.LO***) occurs when an enthalpy sensor is installed and the Outdoor Enthalpy is HIGH. OAQ Lockout Mode (***Operating Modes→ECON→AQ.LO***) occurs when the outdoor air quality sensor is configured for lockout and the value is greater then the OAQ Lockout Limit (***Configuration→AIR.Q→OAQ.L***). Any one of these lockouts will disable economizer free cooling.

If the economizer is available for cooling, the economizer outside air and return air dampers will modulate to allow proportions of outside air and return air to mix and produce a supply air temperature equal to the Supply Air Control Point (***Run Status→COOL→SA.CP***). The damper will open from the Min Position In Effect (***Run Status→ECON →EC.MP***) to the Econo Cool Max Position (***Configuration →ECON→EC.MX***). If the economizer is not able to satisfy the Supply Air Control Point (SA.CP), the compressor will turn on and modulate to provide additional cooling. The economizer will then be left at max position and the compressor will be allowed to violate Min Compressor Capacity (MIN.C) and ramp down to 15% capacity.

Unoccupied Free Cooling

The unoccupied free cooling algorithm attempts to maintain the building space half way between the Occupied Cool Set Point (***Setpoints→OCSP***) and Occupied Heat Set Point (***Setpoints →OHSP***) using only the economizer when the conditions in the building and the outdoors are suitable, during unoccupied periods. Three different configurations define this algorithm: Unoccupied Free Cooling (***Configuration→ECON→UEFC***), Free Cooling Preoccupancy Time (***Configuration→ECON→FC.TM***), and Free Cool Low Temp Limit (***Configuration→ECON→FC.LO***).

UEFC = 0 (Disabled)

When UEFC = 0, unoccupied free cooling is disabled. Cooling will only occur if the space exceeds the unoccupied setpoints.

UEFC = 1 (Unoccupied)

When UEFC is set to 1, unoccupied free cooling can occur throughout the entire unoccupied period. The space temperature must be higher than the mid-point between the occupied cooling and heating setpoints.

UEFC = 2 (Preoccupancy)

When UEFC is set to 2, unoccupied free cooling can only occur when the time until the next occupied period is less than the Free Cool PreOcc Time (FC.TM) in minutes.

Free Cool PreOcc Time (FC.TM)

FC.TM is the configuration that determines how many minutes before occupancy that free cooling can occur when set for Preoccupancy (UEFC = 2).

Free Cool Low Temp Limit (FC.LO)

Unoccupied free cooling cannot occur if the Outdoor Air Temperature (***Temperature→AIR.T→OAT***) is less than FC.LO.

Power Exhaust

To enable power exhaust, set Power Exhaust Installed (***Configuration→ECON→PE.EN***) to YES. Both power exhaust fans are wired together and are controlled by the configuration Power Exhaust Stage1 CFM (***Configuration→ECON→PE1.C***). When the Indoor Fan Max Speed CFM (***Configuration→ECON →IDF.C***) is set to the correct supply duct CFM (either by fan tables or air balance report) the control will calculate the outside air CFM based on outside air damper position and Commanded Fan Speed (***Outputs→FANS→F.SPD***) to turn on the power exhaust when the calculated outside air CFM reaches Power Exhaust Stage1 CFM (PE1.C). The power exhaust will then turn off when the calculated outside air CFM falls below Power Exhaust Stage1 CFM (PE1.C). The Power Exhaust Stage2 CFM (***Configuration →ECON→PE2.C***) is not currently used on the 48/50PD-05 and 06 units.

Indoor Air Quality (IAQ)

The *Comfort*Link™ control has the capability for several methods of demand ventilation control. Indoor air quality is typically measured using a CO_2 sensor whose measurements are displayed in parts per million (ppm). Outdoor air quality may be measured with a CO_2 sensor for indoor-outdoor differential demand ventilation control, or with other sensor types for the outdoor air lockout function. The factory-installed indoor air quality CO_2 sensor is mounted in the return section. A field-installed indoor air quality CO_2 sensor may be mounted in the return or directly in the occupied space, per job requirements. The indoor air quality modes of operation can be affected by the IAQ Analog Input Config (***Configuration→AIR.Q→IA.CF***), IAQ Switch Input Config (***Configuration→AIR.Q→II.CF***), OAQ Analog Input Config (***Configuration→AIR.Q→OA.CF***) and other related fan and limit configurations as described below.

IAQ (Analog Input)

The *Comfort*Link™ control is configured for indoor air quality sensors which provide 4 to 20 mA signal for 0 to 2000 ppm CO_2. If the sensor being used has a different range, the ppm display range must be reconfigured by entering new values for the IAQ Sensor Value at 4mA (***Configuration→AIR.Q→I.4M***) and IAQ Sensor Value at 20mA (***Configuration→AIR.Q→I.20M***).

IA.CF = O (No IAQ)

IA.CF = 0 signifies that there is no IAQ sensor installed. The damper will operate at the Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***) when the fan is at Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***) and the damper position will vary at other fan speeds as described in the Cooling Mode with Economizer section below when the space is occupied and the indoor fan is on.

IA.CF = 1 (DCV)

When IA.CF = 1, the IAQ algorithm is set for Demand Control Ventilation (DCV). During DCV, the damper modulates between two user configurations depending upon the relationship between the Indoor Air Quality (IAQ) and the Outdoor Air Quality (OAQ). The lower of these two positions is referred to as the Econo Min IAQ Position (***Configuration→AIR.Q→AQ.MN***), while the higher is referred to as the Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***). The Econo Min IAQ Position (AQ.MN) should be set to an economizer position that brings in enough fresh air to remove contaminates and CO_2 generated by sources other than people. The Econ Min at Max Fan Speed (MP.MX) should be set to an economizer position that brings in fresh air to remove contaminates and CO_2 generated by all sources including people when the indoor fan is operating at the Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***). The Econ Min at Max Fan Speed (MP.MX) value is the design value for maximum occupancy.

The *Comfort*Link™ control will begin to open the damper from the Econo Min IAQ Position (AQ.MN) position when the IAQ level begins to exceed the Outdoor Air Quality (OAQ) level by a configurable amount. This amount is referred to as AQ Differential Low (***Configuration→AIR.Q→AQD.L***). When the differential between IAQ and OAQ reaches AQ Differential High (***Configuration→AIR.Q→AQD.H***), the economizer position will be at the Econ Min at Max Fan Speed (MP.MX) when the indoor fan speed is at Supply Fan Maximum Speed (FS.MX). When the IAQ/OAQ differential is between AQ Differential Low (AQD.L) and AQ Differential High (AQD.H), the control will modulate the damper between Econ Min at Max Fan Speed (MP.MX) and Econo Min IAQ Position (AQ.MN) in a linear manner as shown in Fig. 8. At other fan speeds the economizer damper will operate in the shaded area between the two economizer position curves but at the actual fan speed as indicated by Commanded Fan Speed (***Outputs →FANS→F.SPD***). (See Fig. 7.)

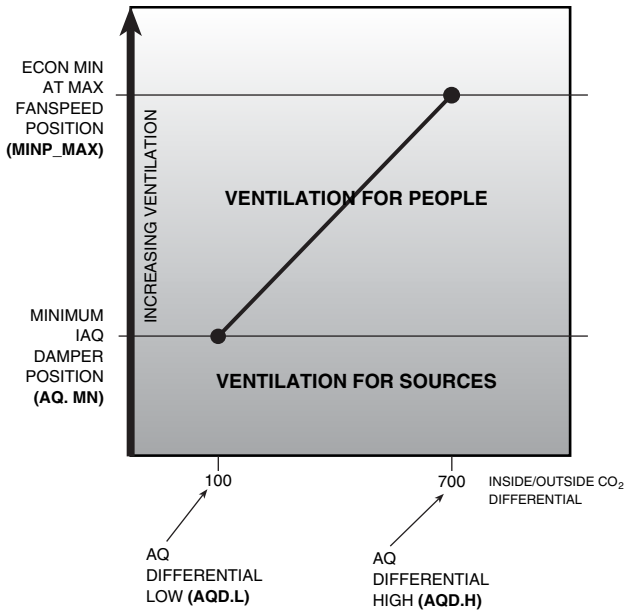


Fig. 8 - Economizer Minimum Position

IA.CF = 2 (Override IAQ)

When IA.CF = 2, the IAQ algorithm maintains the damper at Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***) when the indoor fan speed is at Supply Fan Maximum Speed (***Configuration→UNIT→FS.MX***) or along the curve on Fig. 7 when the indoor fan speed is at the Commanded Fan Speed (***Outputs→FANS→F.SPD***) until the override condition triggers. The override triggers when the IAQ/OAQ differential is greater than AQ Differential High (***Configuration→AIR.Q→AQD.H***). The IAQ Override Position (***Configuration→AIR.Q→OVR.P***) sets the damper position during override. The economizer damper will return to the Econ Min at Max Fan Speed (MP.MX) or MP.MX curve at other fan speeds when the IAQ/OAQ differential is less than the AQ Differential Low (***Configuration→AIR.Q→AQD.L***).

The override algorithm will operate whenever the building is occupied and the indoor fan is operating or whenever the IAQ algorithm has caused the indoor fan to operate. The IAQ Analog Fan Config (***Configuration→AIR.Q→IA.FN***) determines whether or not the IAQ algorithm can turn on the indoor fan. If the indoor fan is not operating, the economizer position will be zero. If the override is not active and the building is unoccupied, the economizer position will be zero. The damper position may exceed Econ Min at Max Fan Speed (MP.MX) or IAQ Override Position (OVR.P) to provide economizer cooling.

IA.CF = 3 (Control Minimum Position)

When IA.CF = 3, an external 4 to 20 mA source is used to set the minimum position. The 4mA signal corresponds to 0% and the 20 mA signal corresponds to 100%. In this mode, configurations such as Econ Min at Max Fan Speed (***Configuration→ECON →MP.MX***), Econo Min IAQ Position (***Configuration→AIR.Q →AQ.MN***) and the economizer minimum position and DCV minimum position curves in Fig. 7 and 8 are not used. If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed the economizer minimum position to provide economizer cooling.

IAQ (Switch Input)

Indoor air quality can also be measured using a switch input. For the purpose of specifying the type of switch input, low CO_2 levels are considered normal. The IAQ switch input is defined by the IAQ Switch Input Config (***Configuration→AIR.Q→II.CF***). Enthalpy and IAQ are controlled by the same switch input and therefore cannot be used simultaneously.

II.CF = 0 (No IAQ)

The II.CF = 0 configuration signifies that there is no IAQ switch input. The damper will operate at the Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***) and corresponding damper position curve based on indoor fan speed when the space is occupied and the indoor fan is on.

II.CF = 1 (DCV Normally Open) or II.CF = 2 (DCV Normally Closed)

The Demand Control Ventilation (DCV) allows the economizer minimum position to be decreased when there is no IAQ problem. If IAQ is low, the economizer minimum position is Econo Min IAQ Position (***Configuration→AIR.Q→AQ.MN***) when the indoor fan is operating at Supply Fan Maximum Speed (***Configuration →UNIT→FS.MX***). If IAQ is high, the economizer minimum position is Econ Min at Max Fan Speed (***Configuration→ECON →MP.MX***) when the indoor fan is operating at Supply Fan Maximum Speed (FS.MX). If the fan speed is modulating, see Fig. 7 for higher or lower damper position setting at the specific fan speed.

II.CF = 3 (Override Normally Open) or II.CF = 4 (Override Normally Closed)

The damper override function permits absolute positioning of the economizer damper for ventilation purposes. The override is active when IAQ is high and inactive when IAQ is low. The override position is configured by the IAQ Override Position (***Configuration→AIR.Q→OVR.P***).

Outdoor Air Quality (Analog Input)

The *Comfort*Link™ control can be configured for outdoor air quality sensors which provide a 4 to 20 mA signal corresponding to 0 to 2000 ppm CO_2. If a field supplied sensor has a different range, the ppm display range must be reconfigured by entering new values for the OAQ Sensor Value at 4mA (***Configuration→AIR.Q →O.4M***) and OAQ Sensor Value at 20mA (***Configuration →AIR.Q→O.20M***).

OA.CF = 0 (No OAQ)

This signifies that there is no outdoor air sensor installed. The default value of OAQ is 400 ppm CO_2 when using demand control ventilation (DCV).

OA.CF = 1 (DCV)

The outdoor air quality sensor analog input is the value of OAQ for demand control ventilation (DCV).

OA.CF = 2 (OAQ Lockout)

The outdoor air quality analog input is only used to lock out the outdoor ventilation. The economizer commanded position is set to 0% when the CO_2 ppm exceeds the OAQ lockout value configured for the OAQ Lockout Limit (***Configuration→AIR.Q →OAQ.L***). The default value for OAQ Lockout Limit (***OAQ.L***) is 600 ppm CO_2.

Fan Enable (Analog IAQ Sensor)

The DCV algorithm will operate whenever the building is occupied and the indoor fan is operating or whenever the IAQ algorithm has caused the indoor fan to operate. The IAQ Analog Fan Config (***Configuration→AIR.Q→IA.FN***) determines whether or not the IAQ algorithm can turn on the indoor fan. If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***) and corresponding damper position curve to provide economizer cooling.

IA.FN = 0 (Never)

When IA.FN = 0, the IAQ algorithm can never turn on the fan.

IA.FN = 1 (Occupied)

When IA.FN =1, the IAQ algorithm will turn on the indoor fan whenever the building is occupied and IAQ/OAQ differential is greater than the Fan On AQ Differential (***Configuration→AIR.Q →DF.ON***). The indoor fan will turn off when the IAQ/OAQ differential is less than the Fan Off AQ Differential (***Configuration →AIR.Q→DF.OF***).

IA.FN = 2 (Always)

The indoor fan operation for IA.FN = 2, is the same as the operation when IA.FN =1, except the algorithm is not limited to the occupied periods only. The fan can be triggered on when the space is occupied or unoccupied.

Fan Enable (Switch Input)

The DCV algorithm will operate whenever the building is occupied and the indoor fan is operating or whenever the IAQ algorithm has caused the indoor fan to operate. The IAQ Switch Fan Config (***Configuration→AIR.Q→II.FN***) determines whether or not the IAQ algorithm can turn on the indoor fan. If the indoor fan is not operating, the economizer position will be zero. The damper position may exceed Econ Min at Max Fan Speed (***Configuration→ECON→MP.MX***) and corresponding damper position curve to provide economizer cooling.

II.FN = 0 (Never)

When the II.FN = 0, the IAQ algorithm can never turn on fan.

II.FN = 1 (Occupied)

When II.FN =1, the IAQ algorithm will turn on the indoor fan whenever the building is occupied and IAQ is high. The indoor fan will turn off when the IAQ returns to normal.

II.FN = 2 (Always)

The indoor fan operation for II.FN =2 is the same as the operation when IA.FN =1, except the algorithm is not limited to the occupied periods only. The fan can be triggered on when the space is occupied or unoccupied.

Temperature Compensated Start

This logic is used when the unit is in the unoccupied state. The control will calculate early Start Bias time based on Space Temperature deviation from the occupied cooling and heating set points. This will allow the control to start the unit so that the space is at conditioned levels when the occupied period starts. This is required for ASHRAE 90.1 compliance.

Setting Up the System

The settings for temperature compensated start can be found in the local display under ***Configuration→UNIT***.

ITEM	EXPANSION	RANGE	UNITS	CCN POINT
TCS.C	Temp.Cmp.Strt.Cool Factr	0 – 60	min	TCSTCOOL
TCS.H	Temp.Cmp.Strt.Heat Factr	0 – 60	min	TCSTHEAT

Temp Comp Strt Cool Factr (TCS.C)

This is the factor for the start time bias equation for cooling.

Temp Comp Strt Heat Factr (TCS.H)

This is the factor for the start time bias equation for heating.

NOTE: Temperature compensated start is disabled when these factors are set to 0.

Temperature Compensated Start Logic

The following conditions must be met for the algorithm to run:

- Unit is in unoccupied state.
- Next occupied time is valid.
- Current time of day is valid.
- Valid space temperature reading is available (sensor or CCN network).

The algorithm will calculate a Start Bias time in minutes using the following equations:

If (space temperature > occupied cooling set point)

Start Bias Time = (space temperature - occupied cooling set point)**TCS.C*

If (space temperature < occupied heating set point)

Start Bias Time = (occupied heating set point - space temperature)**TCS.H*

When the Start Bias Time is greater than zero the algorithm will subtract it from the next occupied time to calculate the new start time. When the new start time is reached, the Temperature Compensated Start mode is set, the fan is started and the unit controlled as in an occupied state. Once set, Temperature Compensated mode will stay on until the unit goes into the Occupied mode. The Start Bias Time will be written into the CCN Linkage Equipment Table if the unit is controlled in DAV mode. If the Unoccupied Economizer Free Cool mode is active when temperature compensated start begins, the Unoccupied Free Cool mode will be stopped.

IMPORTANT: The maximum minutes Start Bias can be is 180.

Carrier Comfort Network (CCN)® Configuration

It is possible to configure the *Comfort*Link™ control to participate as an element of the Carrier Comfort Network (CCN) system directly from the local display. This section will deal with explaining the various programmable options which are found under the CCN sub-menu in the Configuration mode.

The major configurations for CCN programming are located in the local displays at ***Configuration→CCN***. See Appendix A.

CCN Address (CCN.A)

This configuration is the CCN address the rooftop is assigned.

CCN Address (CCN.B)

This configuration is the CCN bus the rooftop is assigned.

CCN Baud Rate (BAUD)

This configuration is the CCN baud rate.

CCN Time/Date Broadcast (BROD→B.TIM)

If this configuration is set to ON, the control will periodically send the time and date out onto the CCN bus once a minute. If this device is on a CCN network then it will be important to make sure that only one device on the bus has this configuration set to ON. If more than one time broadcaster is present, problems with the time will occur.

IMPORTANT: Only the time and date broadcaster can perform daylight savings time adjustments. Even if the rooftop is stand alone, the user may want to set this to ON to accomplish the daylight/savings function.

CCN OAT Broadcast (BROD→B.OAT)

If this configuration is set to ON, the control will periodically broadcast its outside-air temperature at a rate of once every 30 minutes.

Global Schedule Broadcast (BROD→B.GS)

If this configuration is set to ON and the schedule number (***SCH.N***) is between 65 and 99, then the control will broadcast the internal time schedule once every 2 minutes.

CCN Broadcast Acknowledger (BROD→B.ACK)

If this configuration is set to ON, then when any broadcasting is done on the bus, this device will respond to and acknowledge. Only one device per bus can be configured for this option.

Schedule Number (SCH.O→SCH.N)

This configuration determines what schedule the control may follow.

SCH.N = 0	**The control is always occupied.**
SCH.N = 1	**The control follows its internal time schedules. The user may enter any number between 1 and 64 but it will be overwritten to "1" by the control as it only has one internal schedule.**
SCH.N = 65-99	**The control is either set up to receive to a broadcasted time schedule set to this number or the control is set up to broadcast its internal time schedule (*B.GS*) to the network and this is the global schedule number it is broadcasting. If this is the case, then the control still follows its internal time schedules.**

Accept Global Holidays? (SCH.O→HOL.G)

If a device is broadcasting the time on the bus, it is possible to accept the time yet not accept the global holiday from the broadcast message.

Override Time Limit (SCH.O→OV.TL)

This configuration allows the user to decide how long an override occurs when it is initiated. The override may be configured from 1 to 4 hours. If the time is set to 0, the override function will become disabled.

Timed Override Hours (SCH.O→OV.EX)

This displays the current number of hours left in an override. It is possible to cancel an override in progress by writing "0" to this variable, thereby removing the override time left.

SPT Override Enabled? (SCH.O→OV.SP)

If a space sensor is present, then it is possible to override an unoccupied period by pushing the override button on the T55 or T56 sensor. This option allows the user to disable this function by setting this configuration to NO.

Demand Limit

Demand Limit Control may override the cooling algorithm to limit or reduce cooling capacity during run time. The term Demand Limit Control refers to the restriction of machine capacity to control the amount of power that a machine will use. This can save the owner money by limiting peaks in the power supply. Demand limit control is intended to interface with an external network system. This is through a CCN Loadshed POC Device or writing to network points.

To limit stages through network writes, the points ***Run Status →COOL→MAX.C*** and ***Run Status→HEAT→MAX.H*** are forced on the network through CCN points MAX_CAPC and MAXHSTGS respectively. Force these to the desired maximum cooling/dehumidification capacity and the maximum heating stages, respectively. When there is no force on these points, they automatically reset to allow full cooling/dehumidification capacity and all heating stages to be used. These points are reset at power-on/reset (POR).

When using the Loadshed POC to do Demand Limiting, the cool capacity and heat stage limits under both Redline and Loadshed conditions can be set individually with configuration decisions. If the active stages are greater then the loadshed or redline configurations when a loadshed or redline command is given, the unit will reduce capacity or remove stages. The configuration points can be found in ***Configuration→CCN→LDS***.

Loadshed Group Number (S.GRP)

This corresponds to the loadshed supervisory devices that reside elsewhere on the CCN network and broadcast loadshed and redline commands to its associated equipment parts. This variable will default to zero which is an invalid group number. This allows the loadshed function to be disabled until configured.

Redline Max Capacity (R.MXC)

This configuration tells the unit the maximum cooling/dehumidification capacity allowed active during a redline condition.

Loadshed Max Capacity

This configuration tells the unit the maximum cooling/dehumidification capacity allowed active during a loadshed condition.

Redline Max Heat Stages (R.MXH)

This configuration tells the unit the maximum heating stages allowed to be on during a redline condition.

Loadshed Max Heat Stages (R.MXH)

This configuration tells the unit the maximum heating stages allowed to be on during a loadshed condition.

The two Demand Limiting methods can be active simultaneously. The lowest cool capacity and heat stage limits imposed by either method are applied, and these "effective limits" are shown in the points CAPLIMIT (***Run Status→COOL→LMT.C***) and HSTGLIMT (***Run Status→HEAT→LMT.H***), respectively. In normal running mode, these limits will prevent capacity/stages from being added, or capacity/stages to be removed, as applicable. In test mode, these limits are ignored, and the user may continue to operate at full load.

The point MODEDMDL (***Run Status→MODE→D.LMT***) is used to show if any Demand Limiting is in effect that prevents the unit from operating either cooling or heating at full-capacity.

IMPORTANT: MODEDMDL may reflect that staging is NOT limited even though Loadshed is active or the network points are being forced, if the capacity/stage limits in effect are not less than the capacity/stages present in the unit.

If a more drastic mode of Demand Limiting is required, the network point HVACDOWN (***Run Status→MODE→HV.DN***) can be used to prohibit the unit from selecting any HVAC mode, thus preventing the operation of the supply fan, compressors, condenser fans, and heat stages. This point must also be forced, and is reset automatically when not forced, and at POR. A force on this point will shutdown the unit and disable operation until removed.

Alarm Handling

There are a variety of different alerts and alarms in the system. Alerts are indicated by TXXX (where XXX is the alert number) on the display and generally signify that the improperly functioning circuit can restart without human interaction. If an alarm occurs, indicated by AXXX (where XXX is the alarm number), the damaged circuit will generally not restart without an alarm reset via the Scrolling Marquee display or CCN.

The response of the control system to various alerts and alarms depends on the seriousness of the particular alert or alarm. In the mildest case, an alert does not affect the operation of the unit in any manner. An alert can also cause a "strike." A "striking" alert will cause the circuit to shut down for 15 minutes. This feature reduces the likelihood of false alarms causing a properly working system to be shut down incorrectly. If three strikes occur before the circuit has an opportunity to show that it can function properly, the circuit will strike out, causing the shutdown alarm for that particular circuit. Once activated, the shutdown alarm can only be cleared via an alarm reset.

However, circuits with strikes will be given an opportunity to reset their strike counter to zero. As discussed above, a strike typically causes the circuit to shut down. Fifteen minutes later, that circuit will once again be allowed to run. If the circuit is able to run for 1 minute, its replacement circuit will be allowed to shut down (if not required to run to satisfy requested stages). However, the "troubled" circuit must run continuously for a user defined time (***Configuration→COOL→RST.C***) with no detectable problems before the strike counter will be reset to zero. Default value is 5 minutes.

CCN Alarm Broadcast

Operators of CCN networks might not want to be notified of "striking" alerts for refrigerant circuits until the circuit has been shut down due to 3 strikes. Set the cooling configuration of Alert Each Strike (***Configuration→COOL→ALM.N*** on display, ALM_NOW on CCN) to YES to broadcast each circuit strike alert. Set Alert Each Strike to NO to broadcast only circuit shut down. Alert Each Strike configuration is ignored during Service Test and all alerts are broadcast.

Alarm Relay Output

The alarm relay output is a normally open 24 vac output between field connection terminal board terminals C and X. Selection of which alerts and alarms will result in closing of the alarm relay may be set in the Alarm Relay Configuration (***Configuration→ALM.O***). Setting a configuration to YES will result in the alarm output relay, ***ALRM***, status of ON and 24 vac between C and X when that particular condition is in an alarm state. Setting a configuration to NO will result in no action by the alarm output relay for that particular condition.

IMPORTANT: An accessory filter switch can be used along with the alarm relay output function to indicate dirty filter service need.

See the Troubleshooting section for more information on viewing, diagnosing, and clearing alerts and alarms.

TROUBLESHOOTING

The Scrolling Marquee display shows the actual operating conditions of the unit while it is running. If there are alarms or there have been alarms, they will be displayed in either the current alarm list or the history alarm list. (See Table 7.) The Service Test mode allows proper operation of the compressors, fans, and other components to be checked while the unit is not operating. See Service Test.

Complete Unit Stoppage

There are several conditions that can cause the unit not to provide heating or cooling:

- If an alarm is active which causes the unit to shut down, diagnose the problem using the information provided in Alarms and Alerts section below.
- Cooling and heating loads are satisfied.
- Programmed occupancy schedule.
- General power failure.
- Tripped CB1 or CB2 (24-volt transformer circuit breakers).
- Unit is turned off through the CCN network.
- If outdoor-air temperature is less than the Compressor Lockout Temperature (***CA.LO***) configuration value, unit cannot cool.
- If outdoor-air temperature is greater than the Heating Lockout Temperature (***HT.LO***) configuration value, unit cannot heat.

Restart Procedure

Before attempting to restart the machine, check the alarm list to determine the cause of the shut down. If the shutdown alarm for a particular control function has occurred, determine and correct the cause before allowing the unit to run under its own control again. When there is problem, the unit should be diagnosed in Service Test mode. The alarms must be reset before the control function can operate in either Normal mode or Service Test mode.

Alarms and Alerts

Viewing and Clearing Unit Alarms

Presence of active alarms will be indicated on the Scrolling Marquee display by the Alarm Status light turning on and by the number of active alarms being displayed in the automatic View of Run Status. Presence of active alarms may also be signaled on the Alarm Output terminals. Each alarm may also be broadcast on the CCN network. Active alarms and past alarm history can be reviewed and cleared via the local display or a CCN device. A quick reference table for alarms is shown in Table 7. The following menu locations are used for the local display:

Alarms→R.CURR (Reset All Current Alarms)

Change to YES to reset all active alarms. Turning unit power off will also reset all current alarms.

Alarms→R.HIST (Reset Alarm History)

Change to YES to reset the alarm history. Turning unit power off will not reset the alarm history.

Alarms→CURR (Currently Active Alarms)

Use the ENTER key, then scroll through any alarm numbers using the up and down arrow keys. Alarms are displayed in numerical order.

Alarms→HIST (Alarm History)

Use the ENTER key, then scroll through any alarm numbers using the up and down arrow keys. Up to 20 alarms are displayed in order of occurrence, with time and date.

The description for an alarm can be viewed on the Scrolling Marquee display by pressing ESCAPE and ENTER keys simultaneously while displaying the alarm code number. Be sure to expand description for each code, because in some cases there are different possible descriptions and causes for the same code number.

Diagnostic Alarm Codes and Possible Causes

Alert Code T051

There are 5 different texts for this alert code. There are three different alerts, two of which have corresponding test mode alerts indicated with "Service Test" in the expanded text. Pressing enter and esc on the marquee or navigator to expand the T051 alert will show you one of the below alerts. Make sure the expanded text is read correctly before troubleshooting.

- Digital Compressor Control Board Alarm

  This alert occurs when the Digital Scroll Controller (DSC) energizes its alarm relay. Refer to the DSC's LED diagnostic to determine which of the nine codes are present. Power cycle will clear the DSC's LED code. When the DSC's alarm clears, this alert will automatically clear.

- Compressor A1 Safety Trip

  This Alert indicates that Current Sensing A1 (CS.A1) has been enabled. The unit does not support the use of a current sensor at this time. Change the CS.A1 to disable and this alert will clear and not return.

  (***Configuration→COOL→CS.A1***)

- Compressor A1 Current Detected After Turnoff

  This Alert indicates that Current Sensing A1 (CS.A1) has been enabled. The unit does not support the use of a current sensor at this time. Change the CS.A1 to disable and this alert will clear and not return.

  (***Configuration→COOL→CS.A1***)

Alert Code T064 - Circuit A Saturated Condensing Temperature Thermistor Failure

This alert occurs when the temperature is outside the range -40° to 240°F (-40° to 116°C). When this occurs, the control will use only the outdoor temperature to control the outdoor fans. If both the SCT and OAT fail, then circuit shutdown alarm will occur also. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T066 - Circuit A Saturated Suction Temperature Thermistor Failure

This alert occurs when the unit's suction transducers are turned off internally. Cooling will not operate. This is usually due to a network force on a non exposed CCN point. Reload factory defaults or reinstall software on the MBB. Consult the network manager if alert continues.

Alert Code T073 - Outdoor Air Temperature Thermistor Failure

This alert occurs when the temperature is outside the range -40° to 240°F (-40° to 116°C). For all units, all ambient temperature lockout limits for cooling and heating are ignored. For all units, if both SCT and OAT fail, then circuit shutdown alarm will also occur. For economizer equipped units, the economizer will not operate to provide cooling. The economizer will still operate for ventilation. The control will use condenser temperatures for outdoor fan control. For units with CCH crankcase heat relay control, the crankcase heat relay will be turned on if any compressor is off. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T074 - Space Temperature Thermistor Failure

This alert occurs when the temperature is outside the range -40° to 240°F (-40° to 116°C). Cooling and heating will not operate. For economizer equipped units, the economizer will still operate for ventilation. This alert resets automatically. The cause of the alert is usually a faulty thermistor in the T-55, T-56, or T-58 device, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T075 - Supply Air Temperature Thermistor Failure

This alert occurs when the temperature is outside the range -40° to 240°F (-40° to 116°C). Economizer cooling and compressor operation cannot occur while this alert is active. The unit will not be allowed to enter cooling mode. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T076 - Return Air Thermistor Failure

This alert occurs when the temperature is outside the range -40° to 240°F (-40° to 116°C). Differential dry bulb crossover control can not occur. Free cooling can only be controlled by the OAT and enthalpy. This alert resets automatically. The cause of the alert is usually a faulty thermistor, a shorted or open thermistor caused by a wiring error, or a loose connection.

Alert Code T077 - Space Relative Humidity Sensor Failure

This alert occurs when the input is less than 3.5 mA and the sensor is configured as installed. If a humidistat is not installed, then dehumidification will not be functional. Check sensor and wiring. This alert clears automatically.

NOTE: An ECB must be installed to use the space relative humidity sensor.

Alert Code T092 - Circuit A Suction Pressure Transducer Failure

This alert occurs when the board does not properly read the transducer voltage. A circuit cannot run when this alert is active. Use the Scrolling Marquee to reset the alarm. The cause of the alert is usually a faulty transducer, faulty 5-v power supply, or a loose connection.

Alert Code T102 - Compressor A1 Current Sensor Failure

This Alert indicates that Current Sensing A1 (CS.A1) has been enabled. The unit does not support the use of a current sensor at this time. Change the CS.A1 to disable and this alert will clear and not return.

(***Configuration→COOL→CS.A1***)

Alert Code T110 - Circuit A Loss of Charge

This alert has "Service Test" text that will be displayed if the alert occurred during service test. This alert occurs when the compressor is OFF and the suction pressure is less than 5 psig and OAT is greater than -5°F for 1 continuous minute. Use the Scrolling Marquee to reset the alert. The cause of the alert is usually low refrigerant pressure or a faulty suction pressure. This alert only occurs when the compressor is OFF because the low refrigerant pressure alarms (alert T133) handle this situation when the compressor is operating.

Alert Code T126 - Circuit A High Discharge Pressure

This alert has "Service Test" text that will be displayed if the alert occurred during service test. This alert occurs when alert T051 is active while the appropriate condensing temperature is greater than 150°F. This alert reset automatically. The cause of the alert is usually an overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high-pressure switch. See Alert T051 for diagnostic procedure.

Alert Code T133 - Circuit A Low Refrigerant Pressure

This alert has "Service Test" text that will be displayed if the alert occurred during service test. This alert occurs when the compressor is operating and the evaporating temperature (converted from the suction pressure) is less than configured low suction control levels, ***Configuration→COOL→SST→SST.1*** (Low Suction - Level 1) or SST.2 (Low Suction - Level 2) or SST.3 (Low Suction Level 3). The circuit SST value must be less than SST.1 (for 5 minutes), SST.2 (for 4 minutes), or SST.3 (for 3 minutes when using the economizer and 1.5 minutes when not using the economizer) for the alert to occur. When the outdoor temperature is less than 40°F, the above values are reduced 1°F for every 2°F the OAT is below 40°F. An alert will also occur if the circuit SST value is less than SST.3 -5°F for 20 seconds and the outdoor temperature is above 40°F. All the above timers will reset if the suction temperature rises above SST.O for 1 minute. This alert causes a strike for the respective circuit. If the OAT is less than 10°F, the circuit will shut down without a strike. This alert will activate when the coil becomes frosted. However, during the 15-minute reset period, the coils will thaw and strike should clear and restart if there is nothing else wrong with the circuit. The alert resets automatically. The cause of the alert is usually low refrigerant charge, dirty filters, evaporator fan operating backwards, loose or broken belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.

Alert Code T143 - Circuit A Failure to Pressurize

This alert has "Service Test" text that will be displayed if the alert occurred during service test. This alert occurs when the compressor turns on and the difference between suction and discharge pressure is less then the Ckt A Minimum Pressure (***Configuration→COOL→SST→PSI.D***). The pressure difference must be greater then PSI.D (default is 20 psi) after 60 seconds and stay above it while running the compressor. This alert causes a strike for the respective circuit. The alert resets automatically. The cause of the alert is usually compressor wiring causing reverse rotation or a faulty compressor.

Alert Code T153 - Real Time Clock Hardware Failure

This alert occurs when the RTC clock chip on the MBB is not responding. Time and date functions will not operate, such as local occupancy schedules. The unit will default to 24/7 unoccupied mode. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the time and date should be tried before board replacement.

Alarm Code A154 - Serial EEPROM Hardware Failure

The unit will completely shut down. The serial EEPROM chip on the MBB, which stores the unit's configuration, is not responding. Recovery is automatic but MBB board replacement may be necessary. Cycling the power to the control should be tried before board replacement.

Alarm Code T155 - Serial EEPROM Storage Failure Error

Configuration data in the serial EEPROM chip can not be verified. The unit will run to last know good values or defaults, and therefore operating errors may occur. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the control points should be tried before board replacement.

Alarm Code A156 - Critical Serial EEPROM Storage Fail Error

The unit will completely shut down. Critical configuration data in the serial EEPROM chip can not be verified. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control and reconfiguring the critical control points should be tried before board replacement. There are no critical configurations in the 48/50PD.

Alert Code A157 - A/D Hardware Failure

The unit will completely shut down. The analog to digital conversion chip on the MBB has failed. Recovery is automatic but MBB board replacement may be necessary. Cycling power to the control should be tried before board replacement.

Alert Code A163 - Circuit A Down Due to Failure

This alert has "Service Test" text that will be displayed if the alert occurred during service test. This alarm occurs when a circuit has 3 strikes. Use the Scrolling Marquee display to reset the alarm. Investigate the alarm that caused the strikes to occur.

Alert Code T178 - Loss of Communication with the Capacity Control Board

This alert occurs when the MBB cannot communicate with the AUX1 board. Unit operation will be disabled. This is usually caused by a wiring problem. Investigate using the Low Voltage Schematic, check that the AUX1 address is correct, and verify the resistance between pins on the LEN connections.

Alert Code T179 - Loss of Communication with the Economizer Control Board

This alert occurs when the MBB cannot communicate with the ECB. Economizer operation will be disabled. This is usually caused by a wiring problem. If a relative humidity sensor is installed and configured but there is not an ECB installed on the unit, this alert will be generated (the ECB is required for RH sensor operation). Investigate using the Low Voltage Schematic, check that the ECB address is correct, and verify the resistance between pins on the LEN connections.

Alert Code T180 - Loss of Communication with the Economizer Actuator

This alert occurs when the ECB cannot communicate with the Belimo Actuator. If the analog signal is connected properly, the economizer can still be controlled through it. This is usually caused by a wiring problem, actuator failure, or the wrong actuator. Investigate using the Low Voltage Schematic, make sure the actuator is a MFT communication actuator, and verify the feedback signal from the actuator is correct.

Alarm Code A200 - Linkage Timeout - Comm Failure

This alarm occurs when the MBB fails to communicate with a Linkage device. This only occurs when the MBB has previously communicated with a Linkage device since last power cycle. If a back up sensor was not installed the T074 alert will occur shortly after this one. Reset power to the unit and verify Linkage is communicating.

Alarm Code A404 - Fire Shutdown

This alarm occurs when the shutdown input is either open or closed depending upon its configuration. This alarm is usually caused by an auxiliary device that is trying to shut down the unit, e.g., smoke detector. The configuration for this switch input can be found at variable ***Configuration→UNIT→FS.SW***. Verify that the configuration is set correct, verify the wiring and auxiliary device. This alarm resets automatically.

Alert Code T408 - Dirty Air Filter

This alert occurs when the Filter Status switch senses a plugged filter for 120 continuous seconds after the indoor fan has been running for 10 seconds. Because the Dirty Air Filter switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at variable ***Configuration→UNIT→FL.SW***. Verify that the configuration is set correct and verify the wiring and filter status switch. The hose should be connected to the low side of the switch. This alert resets automatically.

Alert Code T409

There are 2 different texts for this alert code. Pressing enter and esc on the marquee or navigator to expand the T409 alert will show you one of the below alerts. Make sure the expanded text is read correctly before troubleshooting.

- Fan Status Switch On, Fan Contactor Off

  This alarm occurs when the fan status switch has sensed that the indoor fan has been on for 10 seconds and the indoor fan feedback has determined that the indoor fan should be off. Because the Fan Status switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at ***Configuration→UNIT→FN.SW***. Verify that the configuration is set correctly. Verify the wiring and fan status switch. The hose should be connected to the high side of the switch. If the IDF is configured to shut down the unit when this alarm occurs (***Configuration→UNIT→IDF.F = YES***), then this alarm can only be reset manually and the unit is shut down. If the IDF is not configured to shut the unit down when this alarm occurs (IDF.F = NO), then this alarm resets automatically and no specific control action is taken.
- Fan Status Switch Off, Fan Contactor On

  This alert occurs when the fan status switch has sensed that the indoor fan has been off for 10 seconds and the indoor fan feedback has determined that the indoor fan should be on. Because the Fan Status switch can be configured normally opened or closed, the switch might be open or closed. The configuration for this switch input can be found at ***Configuration→UNIT→FN.SW***. Verify that the configuration is set correctly. Verify the wiring and fan status switch. The hose should be connected to the high side of the switch. If the IDF is configured to shut down the unit down when this alert occurs (***Configuration→UNIT→IDF.F = YES***), then this alarm can only be reset manually and the unit is shut down. If the IDF is not configured to shut the unit down when this alert occurs (IDF.F = NO), then this alert resets automatically and no specific control action is taken.

Alert Code T414

There are 6 different alerts under this one alert code. Pressing enter and esc on the marquee or navigator to expand the T414 alert will show you one of the below alerts. All these alerts are generated by the Belimo actuator and reported to the ECB. These alerts can only occur if the ECB is controlling the actuator digitally through MFT.

- Economizer Damper Actuator Out of Calibration
  This alert occurs when the economizer actuator reports a control angle (***Operating Modes→ECON→C.ANG***) less than the minimum control angle (***Configuration→ECON→M.ANG***). Initiate economizer calibration (***Service Test→INDP→ E.CAL***) using the Service Test menu. The economizer calibration procedure will try to find new maximum open and closed positions. If the alert does not clear automatically after the calibration procedure is complete, investigate what is limiting economizer rotation. After that step, run another calibration, but first power off unit (spring return the damper), loosen the actuator clamp, and while pushing the damper closed tighten the clamp. This alert resets automatically.
- Economizer Damper Actuator Torque Above Load Limit
  This alert occurs when the actuator load is too high. Investigate to determine what is increasing damper load and verify that the actuator is the correct size for the unit. This alert resets automatically.
- Economizer Damper Actuator Hunting Excessively
  This alert occurs when the commanded damper position is changing too rapidly. The stop jog ratio must be less than 21% to clear this alert. Leave the actuator powered with no signal for a few hours to allow the ratio to decrease (may have to wait longer than a few hours). If the alert continues, determine if the ECB or actuator is bad. This alert resets automatically.
- Economizer Damper Stuck or Jammed
  This alarm occurs when the actuator senses it can no longer move. Investigate what is stopping the rotation of the actuator and fix. This alert resets automatically.
- Economizer Damper Actuator Mechanical Failure
  This alert occurs when the actuator senses a catastrophic failure. Investigate actuator and replace if necessary. This alert resets automatically.
- Economizer Damper Actuator Direction Switch Wrong Position
  This alert occurs when the economizer damper direction switch is in the wrong position. The direction switch should be in the clockwise position and the actuator should be mounted so that the CW face of the actuator is accessible. Correct if necessary. This alert clears automatically.

Alert Code T415 - IAQ Input Out of Range

This alert occurs when the IAQ input (on ECB) is less than 3.5 mA and the sensor is configured as installed. IAQ operation will be disabled. Check sensor and wiring. This alert clears automatically.

Alert Code T416 - OAQ Input Out of Range

This alert occurs when the OAQ input (on ECB) is less than 3.5 mA and the sensor is configured as installed. OAQ operation will be disabled. Check sensor and wiring. This alert clears automatically.

Table 7 – *Comfort*Link™ Alarm Codes

ALARM OR ALERT NUMBER	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
T051	Digital Compressor Control Board Alarm	No action	Automatic	See the DSC's LEDs for troubleshooting
	Compressor A1 Safety Trip	Add Strike for Circuit A	Automatic	Current Sensing turned on (CS.A1 = Enable) and should be off
	Service Test – Compressor A1 Safety Trip	Add Strike for Circuit A	Automatic	Current Sensing turned on (CS.A1 = Enable) and should be off
	Compressor A1 Current Detected After Turnoff	Turn off all compressors	Automatic	Current Sensing turned on (CS.A1 = Enable) and should be off
	Service Test – Compressor A1 Current Detected After Turnoff	Turn off all compressors	Automatic	Current Sensing turned on (CS.A1 = Enable) and should be off
T064	Circuit A Saturated Condensing Temp Thermistor Failure	Use OAT to control Outdoor fans	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T066	Circuit A Saturated Suction Temperature Thermistor Failure	No Cooling	Automatic	Suction transducers internally forced inactive
T073	Outdoor Air Temperature Thermistor Failure	No cooling with economizer	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T074	Space Temperature Thermistor Failure	No heating or cooling	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T075	Supply Air Temperature Thermistor Failure	No cooling mode	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T076	Return Air Thermistor Failure	No differential DB crossover	Automatic	Faulty, shorted, or open thermistor caused by wiring error or loose connection.
T077	Space Relative Humidity Sensor Failure	If RH.S = Yes, then no indoor humidity control	Automatic	Faulty, shorted, or open sensor caused by wiring error or loose connection.
T092	Circuit A Suction Pressure Transducer Failure	Shutdown Circuit A	Manual	Faulty transducer, faulty 5–V power supply, or loose connection
T102	Compressor A1 Current Sensor Failure	If CS.A1 = Enable, then no T051 current alarm	Automatic	Current Sensing turned on (CS.A1 = Enable) and should be off
T110	Circuit A Loss of Charge	Shutdown Circuit A	Manual	Low refrigerant or faulty suction pressure transducer
	Service Test – Circuit A Loss of Charge	Shutdown Circuit A	Manual	Low refrigerant or faulty suction pressure transducer
T126	Circuit A High Discharge Pressure	Shutdown Circuit A	Automatic	An overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high–pressure switch.
	Service Test – Circuit A High Discharge Pressure	Shutdown Circuit A	Automatic	An overcharged system, high outdoor ambient temperature coupled with dirty outdoor coil, plugged filter drier, or a faulty high–pressure switch.
T133	Circuit A Low Refrigerant Pressure	Add Strike for Circuit A	Automatic	Low refrigerant charge, dirty filters, evaporator fan turning backwards, loose or broken fan belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.
	Service Test – Circuit A Low Refrigerant Pressure	Add Strike for Circuit A	Automatic	Low refrigerant charge, dirty filters, evaporator fan turning backwards, loose or broken fan belt, plugged filter drier, faulty transducer, excessively cold return air, or stuck open economizer when the ambient temperature is low.
T143	Circuit A Failure To Pressurize	Add Strike for Circuit A	Automatic	Wiring causing reverse rotation or faulty compressor
	Service Test – Circuit A Failure To Pressurize	Add Strike for Circuit A	Automatic	Wiring causing reverse rotation or faulty compressor
T153	Real Timeclock Hardware Failure	No time and date schedule operation	Automatic	No time/date configured, software failure, or MBB failure
A154	Serial EEPROM Hardware Failure	Unit Shutdown	Automatic	Software failure or MBB failure
T155	Serial EEPROM Storage Failure Error	Unit operation errors	Automatic	Software failure or MBB failure
A156	Critical Serial EEPROM Storage Fail Error	Unit Shutdown	Automatic	Software failure or MBB failure
A157	A/D Hardware Failure	Unit Shutdown	Automatic	Software failure or MBB failure
A163	Circuit A Down Due to Failure	Shutdown Circuit A	Manual	Circuit has 3 strikes or has been locked out by another alarm
	Service Test – Circuit A Down Due to Failure	Shutdown Circuit A	Manual	Circuit has 1 strike or has been locked out by another alarm
T178	Loss of Communication with the Capacity Control Board	Unit shutdown – HVAC disable	Automatic	Communication wiring problem with AUX1 or faulty MBB, ECB, or AUX1
T179	Loss of communication with the Economizer Control Board	No economizer operation	Automatic	Communication wiring problem with ECB or faulty MBB, ECB, or AUX1
T180	Loss of communication with the Economizer Actuator	No economizer operation	Automatic	Communication wiring problem with actuator.
A200	Linkage Timeout Error – Comm Failure	No Linkage Operation fall back to local SPT	Automatic	Received a table write from Linkage before, now not receiving any linked commands
A404	Fire Shutdown	Unit Shutdown	Automatic	Smoke detected by smoke detector
T408	Dirty Filter	Alert Generated	Automatic	Dirty Filter
T409	Fan Status Switch ON, Fan Contactor OFF	If IDF.F = Yes, then Unit Shutdown	If IDF.F = YES, then Manual, otherwise automatic	Bad Fan Status Switch. Configuration incorrect.
	Fan Status Switch OFF, Fan Contactor ON	If IDF.F = Yes, then Unit Shutdown	If IDF.F = YES, then Manual, otherwise automatic	Tripped Circuit Breaker. Broken belt. Bad indoor fan motor. Configuration incorrect. Bad fan status switch.
T414	Economizer Damper Actuator Out of Calibration	Alert Generated	Automatic	Calibrate economizer (E.CAL). If problem still exist then determine what is limiting economizer rotation.
	Economizer Damper Actuator Torque Above Load Limit	Alert Generated	Automatic	Actuator load too high. Check damper load.
	Economizer Damper Actuator Hunting Excessively	Alert Generated	Automatic	Damper position changing too quickly.
	Economizer Damper Stuck or Jammed	Alert Generated	Automatic	No economizer motion. Check damper blades, gears, and actuator.
	Economizer Damper Actuator Mechanical Failure	Alert Generated	Automatic	Check actuator and replace if necessary.
	Economizer Damper Actuator Direction Switch Wrong	Alert Generated	Automatic	Actuator direction control switch (CCW, CW) wrong.
T415	IAQ Input Out of Range	No IAQ Operations	Automatic	Bad sensor, bad wiring, or sensor configured incorrectly.
T416	OAQ Input Out of Range	No OAQ Operations	Automatic	Bad sensor, bad wiring, or sensor configured incorrectly.

LEGEND

ECB – Economizer Control Board
IGC – Integrated Gas Controller
MBB – Main Base Board
OAT – Outdoor–Air Thermistor

Table 8 – LEN and CCN Communication Resistances

Device	Board Serial Number	(LEN) Resistance between Pins/ Connector			(CCN) Resistance between Pins/ Connector		
		Pins 1 to 3	Pins 1 to 2	Pins 2 to 3	Pins 5 to 7	Pins 5 to 6	Pins 6 to 7
MBB	Prior to 4702N	15K Ω J3, J4, & J5	7.5K Ω J3, J4, & J5	7.5K Ω J3, J4, & J5	15K Ω J5	7.5K Ω J5	7.5K Ω J5
	Starting 4702N	18.9K Ω J3, J4, & J5	9.9K Ω J3, J4, & J5	9.9K Ω J3, J4, & J5	18.9K Ω J5	9.9K Ω J5	9.9K Ω J5
ECB	Prior to 0803N	5.9K Ω J2	5.2K Ω J2	5K Ω J2	–	–	–
	Starting 0803N	18.9K Ω J2	9.9K Ω J2	9.9K Ω J2	–	–	–
AUX1	–	29K Ω J9	16K Ω J9	13.5K Ω J9	–	–	–

Control Module Communication

Red LED

Proper operation of the MBB, ECB and AUX1 control boards can be visually checked by looking at the red status LEDs. When operating correctly, the red status LEDs should blink in unison at a rate of once every 2 seconds. If the red LED on the ECB and AUX1 is not blinking, check the DIP switch positions on the board. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. A blinking red LED at the rate of once per second means that software is not loaded on the board. Also, be sure that the board is supplied with the current software. If necessary, reload current software. A board LED that is lit continuously should be replaced.

Green LED

The MBB, ECB and AUX1 each have one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. If LEN LED is not blinking, check LEN connections for potential communication errors (MBB J3, J4, and J5). Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB also provides both power and communication directly to the Scrolling Marquee display. The J5 connector on the MBB provides a LEN interface at the field connection terminal (TB).

Yellow LED

The MBB has one yellow LED which is used to indicate CCN communication activity. The Carrier Comfort Network® (CCN) LED will blink during times of network communication.

Communication Failures

If the Scrolling Marquee or Navigator display Communication Failure or the green or yellow LED's do not flash on the boards then the problem could be the communication chip on one of the control boards (MBB, ECB or AUX1). Use an ohm meter to measure the resistance on the communication pins of the boards to determine if the board is bad. If the reading is less than half the value indicated in Table 8, then the board needs to be replaced.

IMPORTANT: The resistive values should be read when the board is powered off and the unit is locked out.

Cooling Troubleshooting

Use the Scrolling Marquee display or a CCN device to view the cooling status display and the cooling diagnostic display (see Appendix A) for information on the cooling operation. Check the current alarms and alarm history for any cooling alarm codes and correct any causes. (See Table 9.)

Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the compressors and fans may be verified by using the Service Test mode. (See Table 5.) See Table 9 for general cooling service analysis.

Table 9 – Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Fan Will Not Start	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped. Check CB1 and CB2.	Replace fuse or reset circuit breaker.
	Disconnect off.	Power disconnect.
	Compressor time guard to prevent short cycling.	Check time guards using ComfortLink™ Scrolling Marquee also the DSC has a 2 minute anti–short time
	Occupancy schedule set point or supply set point not calling for Cooling.	Check cooling demand using ComfortLink Scrolling Marquee.
	Outdoor temperature too low.	Check Compressor Lockout Temperature using ComfortLink Scrolling Marquee.
	Active alarm.	Check active alarms using ComfortLink Scrolling Marquee and DSC alert flash codes
Compressor Cycles (other than normally satisfying demand).	Insufficient line voltage.	Determine cause and correct.
	Active alarm.	Check active alarms using ComfortLink Scrolling Marquee and DSC alert flash codes
Compressor Operates Continuously.	Unit undersized for load.	Decrease load or increase size of unit.
	Occupancy schedule set point or supply set point too low. Compressor running at lowest capacity	Check and adjust set points if needed.
	Compressor contactor stuck on	Check cooling demand using ComfortLink Scrolling Marquee and DSC alert flash codes.
	Dirty air filters.	Replace filters.
	Low refrigerant charge.	Check pressure, locate leak, repair, evacuate, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
Excessive Condenser Pressures.	Loose condenser thermistors.	Tighten thermistors.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharge.	Recover excess refrigerant.
	Faulty TXV.	1.Check TXV bulb mounting and secure tightly to suction line and insulate. 2.Replace TXV (and filter drier) if stuck open or closed.
	Condenser air restricted or air short cycling.	Determine cause and correct.
	Restriction in liquid tube.	Remove restriction.
Condenser Fans Not Operating.	No Power to contactors.	Fuse blown or plug at motor loose.
Excessive Suction Pressure.	High heat load.	Check for sources and eliminate
	Faulty TXV.	1.Check TXV bulb mounting and secure tightly to suction line and insulate. 2.Replace TXV (and filter drier) if stuck open or closed.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low.	Dirty air filters.	Replace air filters.
	Low refrigerant charge.	Check pressure, locate leak, repair, evacuate, and recharge.
	Faulty TXV.	1.Check TXV bulb mounting and secure tightly to suction line and insulate. 2.Replace TXV (and filter drier) if stuck open or closed.
	Insufficient evaporator airflow.	Check belt tension. Check for other restrictions.
	Indoor Fan Running to slow or off while compressor is on	Check VFD display is illuminated and shows Auto mode. Power supplied to VFD. Check 0–10vdc signal present at AUX1 board.
	Temperature too low in conditioned area (low return–air temperature).	Reset thermostat or occupancy schedule.

LEGEND
CB - Circuit Breaker
DSC - Digital Scroll Controller
TXV - Thermostatic Expansion Valve
VFD - Variable Frequency Drive

Digital Scroll Controller (DSC) Troubleshooting

The 48/50PD units are equipped with a digital scroll compressor. The compressor has a solenoid unloader that is controlled by the digital scroll controller (DSC). This DSC turns the unloader on and off within a 20 second window. The amount of time the unloader is on verses off within that 20 seconds depends on the desired capacity. This means that the ComfortLink control does not have direct control of the compressor, but it does however control the power to the DSC and the signal for commanded capacity.

The DSC has three LED lights to help during troubleshooting; green, yellow, and red. The DSC will run the compressor unloaded for a half a second on start up and one second on shutdown to prevent reverse rotation. A two minute anti-short time guard is applied by the DSC after shutting the compressor off. The DSC has an alarm relay output that is connected to the MBB. When this MBB input switch is closed, the MBB activates the T051 alert. Check the LED status on the DSC for flash alarm codes and correct any problems. Table 10 shows the DSC's Red LED flash codes.

POWER LED (green) — indicates voltage is present at the 24VAC power terminal. When the 2 minute anti-short cycle timer is active, the green LED will flash.

UNLOADED LED (yellow) — indicates the unloader solenoid status. The LED is on when the unloader solenoid is energized.

ALERT LED (red) — communicates an abnormal system condition through a unique flash code.

All LEDs Flashing at the Same Rate — indicates 24VAC supply is too low for operation.

All LEDs On Solid at the Same Time — indicates Digital Scroll Controller failure.

Flash Code 1 — Reserved for future use

Flash Code 2 — High Discharge Temperature
This occurs when the discharge temperature thermistor (DTT) has measured a temperature above 268 F (131 C) or the thermistor has short circuited (jumpered out).

The DSC will de-energize the compressor contactor and unloader solenoid, and the alarm relay contacts will close causing a T051 alert on the ComfortLink Control. The compressor will be allowed to restart after 30 minute delay and after the DTT reads below 250 F (120 C). The flash code and alarm relay contacts will be reset after the compressor has run for 60 minutes without any other ALERTs. If five discharge temperature ALERTs have occurred within four hours, the DSC will lock out the compressor. The lockout can only be reset by cycling the 24VAC power off and on.

Flash Code 3 — Compressor Protector Trip
This occurs when the demand signal from the system controller is greater than 1.44VDC and there is no compressor current detected. This could be due to the compressor's internal overload protector being open, fuse or breaker open, power disconnected to compressor contactor, compressor power wiring not run through DSC current transformer port or a compressor contactor failure. The DSC will de-energize the compressor contactor and unloader solenoid and the alarm relay contacts will close causing a T051 alert on the ComfortLink Control. The DSC will wait for the two minute anti-short cycle timer to time out and if the system controller demand signal is still greater than 1.44VDC, energize the compressor contactor again. If compressor current is detected on the restart, the ALERT code and alarm relay output will reset. The DSC will attempt to restart compressor as long as the system controller demand is above 1.44VDC. There is no lockout feature for this ALERT.

Flash Code 4 — Locked Rotor
A locked rotor condition in the compressor is sensed by the DSC on four consecutive start ups. The DSC will de-energize the compressor contactor and unloader solenoid and the alarm relay contacts will close causing a T051 alert on the ComfortLink Control. This code results in a lockout and can only be reset by cycling the 24VAC power off and on.

Flash Code 5 — Demand Signal Loss
This occurs when the demand signal input has dropped below 0.5VDC. The demand input signal wire may be disconnected or the system controller providing the signal may not be powered.
The DSC will de-energize the compressor contactor and unloader solenoid and the alarm relay contacts will close causing a T051 alert on the ComfortLink Control. Once the system controller demand signal input has risen above 0.5VDC, the ALERT code and alarm relay output will reset. If the demand signal is above 1.44VDC and the anti-short cycle timer has timed out, the compressor will restart.

Flash Code 6 — Discharge Thermistor Fault
This occurs when the DSC is not receiving a signal from the discharge temperature thermistor (DTT). The thermistor may be missing, disconnected or a wire broken. The alarm relay contacts will close and the DSC will not increase the capacity of the compressor beyond 50% loading. This ALERT code and alarm relay output are reset by reconnecting the DTT.

Flash Code 7 —Reserved for future use

Flash Code 8 — Compressor Contactor Fault
This occurs when the compressor current is detected when the system controller demand signal is below 1.44VDC. The compressor contactor may have welded contacts or the contacts may be mechanically jammed. The compressor will continue to run in this condition since the DSC cannot open the compressor contactor. The DSC will energize the compressor contactor and the alarm relay contacts will close causing a T051 alert on the ComfortLink Control. The unloader solenoid will remain energized causing the compressor to run unloaded as long as the system controller demand signal is less than 1.44VDC. If the system controller demand is greater than 1.44VDC, the unloader solenoid will de-energize causing the compressor to run loaded. The ALERT code and alarm relay output are reset when current is no longer detected while system controller demand signal is below 1.44VDC.

Flash Code 9 — Low 24VAC Supply
This occurs when the supply voltage to the DSC has dropped below 18.5VDC. The DSC will de-energize the compressor contactor and unloader solenoid. The alarm relay contacts may close if the voltage is high enough for the alarm relay to pull in. The ALERT code and alarm relay output are reset when the supply voltage to the DSC rises above 19.5VAC.

Table 10 – DSC Red LED Flash Codes

LED Flash Code	Description	Action Taken by Control	Reset Method	Probable Cause
1 Flash	Reserved for Future Use	N/A	N/A	N/A
2 Flash	High Discharge Temperature	Compressor shutdown	Automatic	Compressor discharge temperature is greater then 268 degrees F or the DTT is shorted.
3 Flash	Compressor Protector Trip	Compressor shutdown	Automatic	Compressor's internal overload protector being open, fuse or breaker open, power disconnected to compressor contactor, compressor power wiring not run through DSC current transformer port or a compressor contactor failure.
4 Flash	Locked Rotor	Compressor lockout	Manual	Four consecutive start ups with locked rotor.
5 Flash	Demand Signal Loss	Compressor shutdown	Automatic	Signal wire may be disconnected or the system controller providing the signal may not be powered
6 Flash	Discharge Thermistor Fault	Capacity Limited	Automatic	DTT may be missing, disconnected or a wire broken
7 Flash	Reserved for Future Use	N/A	N/A	N/A
8 Flash	Compressor Contactor Fault	Keep capacity at 15%	Automatic	Compressor contactor may have welded contacts or the contacts may be mechanically jammed
9 Flash	Low 24VAC Supply	Compressor shutdown	Automatic	Bad connection or transformer.

Economizer Troubleshooting

Use the unit Scrolling Marquee display or a CCN device to view the economizer status display and the economizer diagnostic display (see Appendix A) for information on the economizer operation. Check the current alarms and alarm history for any economizer alarm codes and correct any causes. (See Table 11.)

Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the economizer may be verified by using the Service Test mode (see Service Test section and Table 5). The following steps specify how to test the economizer using the Scrolling Marquee display. See Table 11 for general economizer service analysis.

1. Enter the ***Service Test*** main menu on the display.
2. Enter ***TEST*** and turn ON test mode. A password may be needed in order to turn ON the Service Test. The default password is 1111.
3. Return to the main level of ***Service Test***.
4. Enter the ***INDP*** submenu and enter an initial value for ***ECON***. This will drive the economizer damper to the specified position. Continue to adjust the ***ECON*** value to make sure the economizer opens and closes.
5. Because of a mechanical problem with the economizer, the actuator might acquire a new degree of rotation which is less than M.ANG. If this occurs, a "T414 Economizer Damper Actuator Out of Calibration" alert will be generated. This alert can only occur if the economizer is using digital communications (***Configuration →ECON→E.CTL* = 1 or 2**). The economizer calibration procedure (***Service Test→IND.P→E.CAL***) will reconfigure the actuator to the new fully closed and fully open positions. To implement the calibration procedure, change ***E.CAL*** from OFF to ON. ***E.CAL*** will remain ON as long as the calibration procedure is being implemented (as long as 5 minutes). During the calibration procedure the actuator will close fully and then open fully. After the calibration is complete, the degree of rotation should be greater than M.ANG, causing the T414 alert to clear. If the T414 alert does not clear, check the economizer damper for other mechanical problems.
6. Return to ***Service Test→TEST*** and turn OFF test mode. This will cause the unit to return to normal operation.

Table 11 – Economizer Service Analysis

PROBLEM	POSSIBLE CAUSE	REMEDY
Damper Does Not Move.	Indoor Fan is off.	Check for proper VFD connections. Check that VFD is illuminated and in Auto mode.
		Unit is not configured for continuous fan operation and there are no cooling or heating demands.
		Unit is in Unoccupied mode and there is no call for heating or cooling.
		Tripped circuit breaker.
		No power to the unit.
		Unit is off via CCN command.
	Actuator is unplugged at motor or at economizer board.	Check wiring connections.
	Unit is not configured for economizer.	Configure unit for economizer per the instructions.
	Outdoor–air temperature is above economizer high temperature lockout.	Adjust the high temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor–air temperature is below economizer low temperature lockout.	Adjust the low temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Communication loss to economizer board.	Check wiring connections.
	Damper is jammed.	Identify the obstruction and safely remove.
Economizer Operation is Limited to Minimum Position.	Minimum position is set incorrectly.	Adjust minimum position setting.
	Outdoor–air temperature is above economizer high temperature lockout.	Adjust the high temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor–air temperature is below economizer low temperature lockout.	Adjust the low temperature lockout setting if it is incorrect, otherwise, economizer is operating correctly.
	Outdoor–air thermistor is faulty.	Replace outdoor–air thermistor.
	Low suction pressure problem with a compressor.	Economizer is operating correctly, identify compressor problem.
Economizer Position is Less Than Minimum Position.	IAQ is controlling minimum damper position.	Adjust the IAQ settings if incorrect, otherwise, the economizer is operating correctly.
	Unit is in Unoccupied mode.	Adjust unit occupied schedule if incorrect, otherwise, economizer is operating correctly.
	Damper is jammed.	Identify the obstruction and safely remove.
Economizer Does Not Return to Minimum Position.	Unit is operating under free cooling.	Economizer is operating correctly.
Damper Does Not Close on Power Loss.	Damper is jammed or spring return is backwards.	Identify the obstruction and safely remove. Remove actuator, flip it over and re–install.
Outdoor Damper Does Not Fully Close at 0% or Fully Open at 100%.	Economizer actuator is out of calibration.	Enter Service Test mode and run the Calibrate Economizer (E.CAL) procedure.
Economizer is not at configured minimum position	Unit is operating under free cooling or a force is being applied to its commanded position.	Economizer is operating correctly.
	Unit fan speed is offsetting the economizer minimum position to maintain proper ventilation.	Economizer is operating correctly.

LEGEND

CCN – Carrier Comfort Network
IAQ – Indoor Air Quality
VFD – Variable Frequency Drive

Heating Troubleshooting

Use the unit Scrolling Marquee display or a CCN device to view the heating status display and the heating diagnostic display (see Appendix A) for information on the heating operation. Check the current alarms and alarm history for any heating alarm codes and correct any causes. (See Table 12.) Verify any unique control configurations per installed site requirements or accessories. If alarms conditions are corrected and cleared, operation of the heat stages and indoor fan may be verified by using the Service Test mode. (See Table 5.)

Gas Heat (48PD Units Only)

See Table 12 for general gas heating service analysis. See Fig. 9 for service analysis of the IGC board logic. Check the status LED on the IGC board for any flashing alarm codes and correct any causes. (See Table 13.)

Electric Heat (50PD Units Only)

See Table 14 for electric heating service analysis.

Variable Frequency Drive (VFD) Troubleshooting

The VFD must be in "Auto" mode and when commanding it to 100% the voltage signal should be 10vdc across AI1 and AIGND. Verify all parameters are correct to factory defaults. See Appendix B for parameters and additional troubleshooting.

Phase Loss Protection

The phase loss protection option will monitor the three-phase electrical system to provide phase reversal and phase loss protection.

Phase Reversal Protection

If the control senses an incorrect phase relationship, the relay (K1) will be de-energized (opening its contact). If the phase relationship is correct, the relay will be energized. The control has a self-bypass function after a pre-set time. If the control determines that the three phases stay in a correct relationship for 10 consecutive minutes, the relay will stay energized regardless of the phase sequence of three inputs as long as 24-vac control voltage is applied. This self-bypass function will be reset if all three phases are restored in a phase loss event.

Phase Loss Protection

If the reverse rotation board senses any one of the three phase inputs has no AC voltage, the relay will be de-energized (opening its contact). This protection is always active as long as 24-vac control voltage is applied, and is not affected by the self by-pass function of the phase sequence monitoring function. However, in the event of phase loss, the relay will be re-energized only if all three phases are restored and the three phases are in the correct sequence.

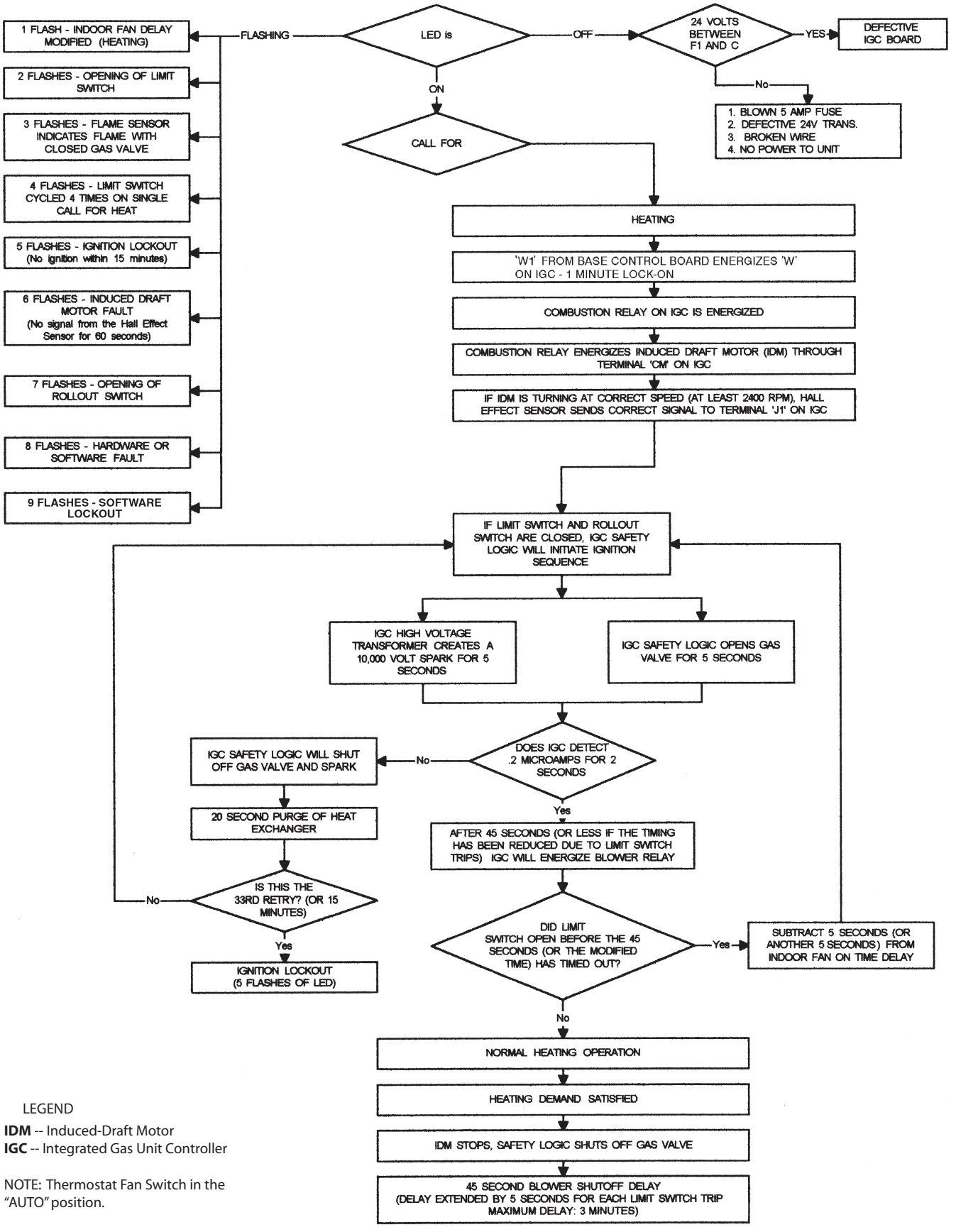
A red LED is provided to indicate the function of the board. See the table below.

LED STATUS	FUNCTION
On Continuously	Relay contact closed (normal operation).
Blinking	Relay contact open (phase loss or phase reversal has occurred) – No power will be supplied to the control system.
Off	24 vac control power not present (off).

Table 12 – Gas Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite.	Unit is not configured for heat.	Check heating configurations using ComfortLink™ Scrolling Marquee.
	Active alarm.	Check active alarms using ComfortLink™ Scrolling Marquee and the IGC alert flash codes.
	No power to unit.	Check power supply, fuses, wiring, and circuit breakers.
	No power to IGC.	Check fuses and plugs.
	Heaters off due to time guard to prevent short cycling.	Check active alarms using ComfortLink™ Scrolling Marquee and the IGC alert flash codes.
	Occupancy schedule set point not calling for Heating.	Check using *Comfort*Link™ Scrolling Marquee.
	No gas at main burners.	Check gas line for air and purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to re–light unit.
	Water in gas line.	Drain water and install drip.
Inadequate Heating.	Dirty air filters.	Replace air filters.
	Gas input too low.	Check gas pressure at manifold. Refer to gas valve adjustment in the Service section.
	Occupancy schedule set point set too low.	Check setpoints and adjust if necessary.
	Unit undersized for load.	Decrease load or increase of size of unit.
	Restricted or low airflow.	Remove restriction, verify proper fan speed operation, and check SAT compared to the SAT heating limits.
	Too much outdoor air.	Check economizer position and configuration. Adjust minimum position if needed using ComfortLink Scrolling Marquee. Verify proper fan speed operation.
	Limit switch cycles main burners.	Check rotation of blower and temperature rise of unit. Adjust as needed.
Poor Flame Characteristics.	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger, replace.
		Unit is over–fired, reduce input. Adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment.
Burners Will Not Turn Off.	Unit is in Minimum on–time.	Check using ComfortLink™ Scrolling Marquee and the IGC alert flash codes.
	Unit running in Service Test mode.	Check using *Comfort*Link™ Scrolling Marquee.
	Main gas valve stuck.	Turn off gas supply and unit power. Replace gas valve.

LEGEND
IGC – Integrated Gas Controller
SAT – Supply Air Temperature



LEGEND

IDM -- Induced-Draft Motor
IGC -- Integrated Gas Unit Controller

NOTE: Thermostat Fan Switch in the "AUTO" position.

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Fig. 9 - IGC Service Analysis Logic

Table 13 – IGC Board LED Alarm Codes

LED FLASH CODE	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
On	Normal Operation	—	—	—
Off	Hardware Failure	No gas heating.	—	Loss of power to the IGC. Check 5 amp fuse on IGC, power to unit, 24V circuit breaker, transformer, and wiring to the IGC.
1 Flash	Indoor Fan On/Off Delay Modified	5 seconds subtracted from On delay. 5 seconds added to Off delay (3 min max).	Power reset.	High temperature limit switch opens during heat exchanger warm-up period before fan-on delay expires. High temperature limit switch opens within 10 minutes of heat call (W) Off. See Limit Switch Fault.
2 Flashes	Limit Switch Fault	Gas valve and igniter Off. Indoor fan and inducer On.	Limit switch closed, or heat call (W) Off.	High temperature limit switch is open. Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is within the range on the unit nameplate. Check wiring and limit switch operation.
3 Flashes	Flame Sense Fault	Indoor fan and inducer On.	Flame sense normal. Power reset for LED reset.	The IGC sensed a flame when the gas valve should be closed. Check wiring, flame sensor, and gas valve operation.
4 Flashes	Four Consecutive Limit Switch Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	4 consecutive limit switch faults within a single call for heat. See Limit Switch Fault.
5 Flashes	Ignition Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	Unit unsuccessfully attempted ignition for 15 minutes. Check igniter and flame sensor electrode spacing, gaps, etc. Check flame sense and igniter wiring. Check gas valve operation and gas supply.
6 Flashes	Induced Draft Motor Fault	If heat off: no gas heating. If heat on: gas valve Off and inducer On.	Inducer sense normal, or heat call (W) Off.	Inducer sense On when heat call Off, or inducer sense Off when heat call On. Check wiring, voltage, and operation of IGC motor. Check speed sensor wiring to IGC.
7 Flashes	Rollout Switch Lockout	Gas valve and igniter Off. Indoor fan and inducer On.	Power reset.	Rollout switch has opened. Check gas valve operation. Check induced-draft blower wheel is properly secured to motor shaft.
8 Flashes	Internal Control Lockout	No gas heating.	Power reset.	IGC has sensed internal hardware or software error. If fault is not cleared by resetting 24 v power, replace the IGC.
9 Flashes	Temporary Software Lockout	No gas heating.	1 hour auto reset, or power reset.	Electrical interference is disrupting the IGC software.

LEGEND

IGC – Integrated Gas Unit Control

LED – Light–Emitting Diode

NOTES:

1. There is a 3–second pause between alarm code displays.
2. If more than one alarm code exists, all applicable alarm codes will be displayed in numerical sequence.
3. Alarm codes on the IGC will be lost if power to the unit is interrupted.

Table 14 – Electric Heat Service Analysis

PROBLEM	CAUSE	REMEDY
Heat Will Not Turn On.	Unit is not configured for heat.	Check heating configurations using ComfortLink™ Scrolling Marquee.
	Active alarm.	Check active alarms using *Comfort*Link™ Scrolling Marquee.
	No power to unit.	Check power supply, fuses, wiring, and circuit breakers.
	Unit is in minimum heat off–time, or minimum cool–heat changeover time.	Check using *Comfort*Link™ Scrolling Marquee.
	Heat forced off in Service Test.	Check using *Comfort*Link™ Scrolling Marquee. Turn Service Test mode off.
	No 24 vac at heater contactor.	Check transformer, circuit breaker, auto–reset limit switches on heater, and manual–reset limit switches (LS) on indoor fan housing.
	Open temperature limit switch on heater.	Check minimum airflow. Check limit switch when it is cool, replace if not.
Inadequate Heating.	Dirty air filters.	Replace air filters.
	Bad heater elements.	Power off unit and remove high voltage wires. Check resistance of element, replace if open.
	Occupancy schedule set point set too low.	Check setpoints and adjust if necessary.
	Heat undersized for load.	Decrease load or increase size of heater.
	Restricted or low airflow.	Remove restriction, verify proper fan speed operation, and check SAT compared to the SAT heating limits.
	Too much outdoor air.	Check economizer position and configuration. Adjust minimum position if needed using ComfortLink™ Scrolling Marquee. Verify proper fan speed operation.
	Limit switch cycles heaters.	Check rotation of blower, temperature rise of unit, and minimum airflow. Adjust as needed.
Heat Will Not Turn Off.	Unit is in minimum heat on–time.	Check using *Comfort*Link™ Scrolling Marquee.
	Occupancy schedule set point still calling for Heating.	Check using *Comfort*Link™ Scrolling Marquee.
	Unit running in Service Test mode.	Check using *Comfort*Link™ Scrolling Marquee.
	Heater contactor failed.	Power off unit. Check contactor and replace if closed.

LEGEND

SAT – Supply Air Temperature

Thermistor Troubleshooting

The electronic control uses thermistors to sense temperatures used to control operation of the unit. Resistances at various temperatures are listed in Table 15–17. Thermistor pin connection points are shown in the Major System Components section. The general locations of the thermistors are shown the Major System Components section.

Air Temperatures

Air temperatures are measured with 10 kilo-ohm thermistors. This includes supply-air temperature (SAT), outdoor-air temperature (OAT), space temperature sensors (T55, T56, T58), and return air temperature (RAT).

The supply air temperature (SAT), return air temperature (RAT) and outdoor air temperature (OAT) thermistors use a snap-mount to attach through the unit sheet metal panels. The snap-mount tabs must be flattened on the tip end of the sensor to release for removal from the panel. (See Fig. 10.) To reinstall, make sure the snap-mount tabs extend out.

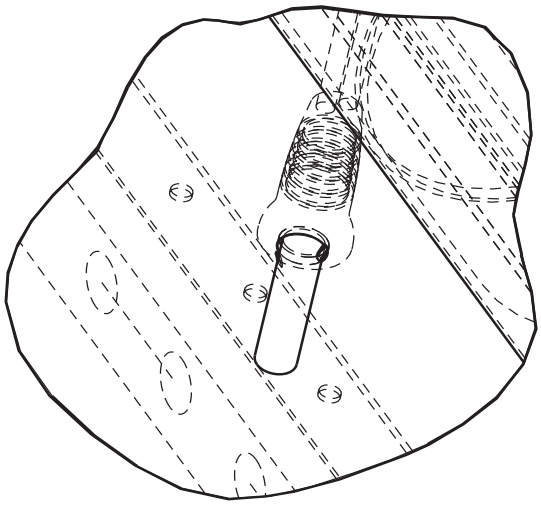

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Fig. 10 – SAT, RAT and OAT Thermistor Mounting

Refrigerant Temperatures

Condenser coil temperatures are measured with 5 kilo-ohm thermistors. These measurements provide an approximate saturated condensing temperature for each circuit (SCT.A). Fig. 11 shows the factory locations for the SCT thermistors on 48/50PD units. Ensure that thermistors are placed at the correct location and are snapped securely over the return bend so that contact is made between the thermistor and the tube.

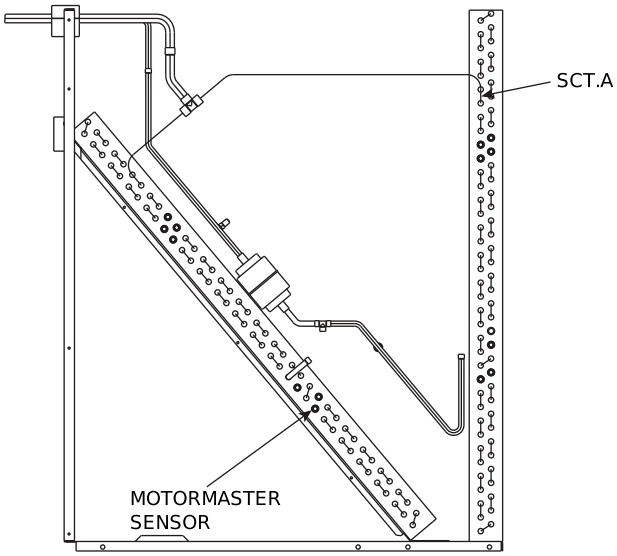

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Fig. 11 – Saturated Condensing Temperature Thermistor Location

Thermistor/Temperature Sensor Check

A high quality digital volt-ohmmeter is required to perform this check.

Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the Main Base Board (see Major System Components section).

Using the voltage reading obtained, read the sensor temperature from Table 15–17.

To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature-measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, within 5°F, if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 terminal, or by determining the resistance with unit shut down and thermistor disconnected from J8. Compare the values determined with the value read by the control in the Temperatures mode using the Scrolling Marquee display.

Sensor Trim

Corrective offsets can be applied to the space temperature and the supply air temperature sensor readings. These corrections are set in the ***Configuration→TRIM*** menu for the display, or in the ***Maintenance→TRIM*** table for CCN. See the Indoor Air Quality section for available adjustments to IAQ and OAQ sensor readings. The space temperature may be corrected by entering either a calibration temperature value in ***SPT.C***, or an offset temperature value in ***SPT.T***. The supply-air temperature may be corrected by entering either a calibration temperature value in ***SAT.C***, or an offset temperature value in ***SAT.T***. The return-air temperature may be corrected by entering either a calibration temperature value in RAT.C or an offset temperature value in RAT.T. Temperature corrections should only be made if sensor readings are compared to an accurate reference temperature measurement device.

Transducer Troubleshooting

The electronic control uses suction pressure transducers to measure the suction pressure of the refrigerant circuits. The pressure/voltage characteristics of these transducers are in shown in Table 18, the 5vdc power is applied to legs A and B of the transducer and legs B to C represent the voltage drop shown in the table. The accuracy of these transducers can be verified by connecting an accurate pressure gauge to the second refrigerant port in the suction line.

Forcing Inputs and Outputs

Many variables may have their value forced through CCN or directly at the local display. This can be useful during diagnostic testing and also during operation, typically as part of an advanced third party control scheme. Input and output points that may be forced are indicated as 'forcible' in the write status column of the display and CCN tables.

If the user needs to force a variable, follow the same process as when editing a configuration parameter. A forced variable will be displayed on the Scrolling Marquee with a blinking period "." following its value. A forced value on Navigator™ accessory is indicated with a blinking "f". A forced value on CCN devices is indicated with "Control" if forced at the unit display, or "Supervisor" if forced via CCN. To remove a local force with the Scrolling Marquee, select the point with the ENTER key and then press the up-arrow and down-arrow keys simultaneously.

IMPORTANT: In the case of a control power reset, any force in effect at the time of power reset will be cleared.

Table 15 – Temperature (°F) vs Resistance/Voltage Drop Values for RAT, OAT, SAT, and SPT Thermistors (10K at 25°C Resistors)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	4.758	196,453	**61**	2.994	14,925	**147**	0.890	2,166
–24	4.750	189,692	**62**	2.963	14,549	**148**	0.876	2,124
–23	4.741	183,300	**63**	2.932	14,180	**149**	0.862	2,083
–22	4.733	177,000	**64**	2.901	13,824	**150**	0.848	2,043
–21	4.724	171,079	**65**	2.870	13,478	**151**	0.835	2,003
–20	4.715	165,238	**66**	2.839	13,139	**152**	0.821	1,966
–19	4.705	159,717	**67**	2.808	12,814	**153**	0.808	1,928
–18	4.696	154,344	**68**	2.777	12,493	**154**	0.795	1,891
–17	4.686	149,194	**69**	2.746	12,187	**155**	0.782	1,855
–16	4.676	144,250	**70**	2.715	11,884	**156**	0.770	1,820
–15	4.665	139,443	**71**	2.684	11,593	**157**	0.758	1,786
–14	4.655	134,891	**72**	2.653	11,308	**158**	0.745	1,752
–13	4.644	130,402	**73**	2.622	11,031	**159**	0.733	1,719
–12	4.633	126,183	**74**	2.592	10,764	**160**	0.722	1,687
–11	4.621	122,018	**75**	2.561	10,501	**161**	0.710	1,656
–10	4.609	118,076	**76**	2.530	10,249	**162**	0.699	1,625
–9	4.597	114,236	**77**	2.500	10,000	**163**	0.687	1,594
–8	4.585	110,549	**78**	2.470	9,762	**164**	0.676	1,565
–7	4.572	107,006	**79**	2.439	9,526	**165**	0.666	1,536
–6	4.560	103,558	**80**	2.409	9,300	**166**	0.655	1,508
–5	4.546	100,287	**81**	2.379	9,078	**167**	0.645	1,480
–4	4.533	97,060	**82**	2.349	8,862	**168**	0.634	1,453
–3	4.519	94,020	**83**	2.319	8,653	**169**	0.624	1,426
–2	4.505	91,019	**84**	2.290	8,448	**170**	0.614	1,400
–1	4.490	88,171	**85**	2.260	8,251	**171**	0.604	1,375
0	4.476	85,396	**86**	2.231	8,056	**172**	0.595	1,350
1	4.461	82,729	**87**	2.202	7,869	**173**	0.585	1,326
2	4.445	80,162	**88**	2.173	7,685	**174**	0.576	1,302
3	4.429	77,662	**89**	2.144	7,507	**175**	0.567	1,278
4	4.413	75,286	**90**	2.115	7,333	**176**	0.558	1,255
5	4.397	72,940	**91**	2.087	7,165	**177**	0.549	1,233
6	4.380	70,727	**92**	2.059	6,999	**178**	0.540	1,211
7	4.363	68,542	**93**	2.030	6,838	**179**	0.532	1,190
8	4.346	66,465	**94**	2.003	6,683	**180**	0.523	1,169
9	4.328	64,439	**95**	1.975	6,530	**181**	0.515	1,148
10	4.310	62,491	**96**	1.948	6,383	**182**	0.507	1,128
11	4.292	60,612	**97**	1.921	6,238	**183**	0.499	1,108
12	4.273	58,781	**98**	1.894	6,098	**184**	0.491	1,089
13	4.254	57,039	**99**	1.867	5,961	**185**	0.483	1,070
14	4.235	55,319	**100**	1.841	5,827	**186**	0.476	1,052
15	4.215	53,693	**101**	1.815	5,698	**187**	0.468	1,033
16	4.195	52,086	**102**	1.789	5,571	**188**	0.461	1,016
17	4.174	50,557	**103**	1.763	5,449	**189**	0.454	998
18	4.153	49,065	**104**	1.738	5,327	**190**	0.447	981
19	4.132	47,627	**105**	1.713	5,210	**191**	0.440	964
20	4.111	46,240	**106**	1.688	5,095	**192**	0.433	947
21	4.089	44,888	**107**	1.663	4,984	**193**	0.426	931
22	4.067	43,598	**108**	1.639	4,876	**194**	0.419	915
23	4.044	42,324	**109**	1.615	4,769	**195**	0.413	900
24	4.021	41,118	**110**	1.591	4,666	**196**	0.407	885
25	3.998	39,926	**111**	1.567	4,564	**197**	0.400	870
26	3.975	38,790	**112**	1.544	4,467	**198**	0.394	855
27	3.951	37,681	**113**	1.521	4,370	**199**	0.388	841
28	3.927	36,610	**114**	1.498	4,277	**200**	0.382	827
29	3.903	35,577	**115**	1.475	4.185	**201**	0.376	814
30	3.878	34,569	**116**	1.453	4,096	**202**	0.370	800
31	3.853	33,606	**117**	1.431	4,008	**203**	0.365	787
32	3.828	32,654	**118**	1.409	3,923	**204**	0.359	774
33	3.802	31,752	**119**	1.387	3,840	**205**	0.354	762
34	3.776	30,860	**120**	1.366	3,759	**206**	0.349	749
35	3.750	30,009	**121**	1.345	3,681	**207**	0.343	737
36	3.723	29,177	**122**	1.324	3,603	**208**	0.338	725
37	3.697	28,373	**123**	1.304	3,529	**209**	0.333	714
38	3.670	27,597	**124**	1.284	3,455	**210**	0.328	702
39	3.654	26,838	**125**	1.264	3,383	**211**	0.323	691
40	3.615	26,113	**126**	1.244	3,313	**212**	0.318	680
41	3.587	25,396	**127**	1.225	3,244	**213**	0.314	670
42	3.559	24,715	**128**	1.206	3,178	**214**	0.309	659
43	3.531	24,042	**129**	1.187	3,112	**215**	0.305	649
44	3.503	23,399	**130**	1.168	3,049	**216**	0.300	639
45	3.474	22,770	**131**	1.150	2,986	**217**	0.296	629
46	3.445	22,161	**132**	1.132	2,926	**218**	0.292	620
47	3.416	21,573	**133**	1.114	2,866	**219**	0.288	610
48	3.387	20,998	**134**	1.096	2,809	**220**	0.284	601
49	3.357	20,447	**135**	1.079	2,752	**221**	0.279	592
50	3.328	19,903	**136**	1.062	2,697	**222**	0.275	583
51	3.298	19,386	**137**	1.045	2,643	**223**	0.272	574
52	3.268	18,874	**138**	1.028	2,590	**224**	0.268	566
53	3.238	18,384	**139**	1.012	2,539	**225**	0.264	557
54	3.208	17,904	**140**	0.996	2,488			
55	3.178	17,441	**141**	0.980	2,439			
56	3.147	16,991	**142**	0.965	2,391			
57	3.117	16,552	**143**	0.949	2,343			
58	3.086	16,131	**144**	0.934	2,297			
59	3.056	15,714	**145**	0.919	2,253			
60	3.025	15,317	**146**	0.905	2,209			

Table 16 – Temperature (°F) vs. Resistance/Voltage Drop Values for SCT Sensors (5K at 25°C Resistors)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	3.699	98,010	**59**	1.982	7,866	**143**	0.511	1,190
–24	3.689	94,707	**60**	1.956	7,665	**144**	0.502	1,165
–23	3.679	91,522	**61**	1.930	7,468	**145**	0.494	1,141
–22	3.668	88,449	**62**	1.905	7,277	**146**	0.485	1,118
–21	3.658	85,486	**63**	1.879	7,091	**147**	0.477	1,095
–20	3.647	82,627	**64**	1.854	6,911	**148**	0.469	1,072
–19	3.636	79,871	**65**	1.829	6,735	**149**	0.461	1,050
–18	3.624	77,212	**66**	1.804	6,564	**150**	0.453	1,029
–17	3.613	74,648	**67**	1.779	6,399	**151**	0.445	1,007
–16	3.601	72,175	**68**	1.754	6,238	**152**	0.438	986
–15	3.588	69,790	**69**	1.729	6,081	**153**	0.430	965
–14	3.576	67,490	**70**	1.705	5,929	**154**	0.423	945
–13	3.563	65,272	**71**	1.681	5,781	**155**	0.416	925
–12	3.550	63,133	**72**	1.656	5,637	**156**	0.408	906
–11	3.536	61,070	**73**	1.632	5,497	**157**	0.402	887
–10	3.523	59,081	**74**	1.609	5,361	**158**	0.395	868
–9	3.509	57,162	**75**	1.585	5,229	**159**	0.388	850
–8	3.494	55,311	**76**	1.562	5,101	**160**	0.381	832
–7	3.480	53,526	**77**	1.538	4,976	**161**	0.375	815
–6	3.465	51,804	**78**	1.516	4,855	**162**	0.369	798
–5	3.450	50,143	**79**	1.493	4,737	**163**	0.362	782
–4	3.434	48,541	**80**	1.470	4,622	**164**	0.356	765
–3	3.418	46,996	**81**	1.448	4,511	**165**	0.350	750
–2	3.402	45,505	**82**	1.426	4,403	**166**	0.344	734
–1	3.386	44,066	**83**	1.404	4,298	**167**	0.339	719
0	3.369	42,679	**84**	1.382	4,196	**168**	0.333	705
1	3.352	41,339	**85**	1.361	4,096	**169**	0.327	690
2	3.335	40,047	**86**	1.340	4,000	**170**	0.322	677
3	3.317	38,800	**87**	1.319	3,906	**171**	0.317	663
4	3.299	37,596	**88**	1.298	3,814	**172**	0.311	650
5	3.281	36,435	**89**	1.278	3,726	**173**	0.306	638
6	3.262	35,313	**90**	1.257	3,640	**174**	0.301	626
7	3.243	34,231	**91**	1.237	3,556	**175**	0.296	614
8	3.224	33,185	**92**	1.217	3,474	**176**	0.291	602
9	3.205	32,176	**93**	1.198	3,395	**177**	0.286	591
10	3.185	31,202	**94**	1.179	3,318	**178**	0.282	581
11	3.165	30,260	**95**	1.160	3,243	**179**	0.277	570
12	3.145	29,351	**96**	1.141	3,170	**180**	0.272	561
13	3.124	28,473	**97**	1.122	3,099	**181**	0.268	551
14	3.103	27,624	**98**	1.104	3,031	**182**	0.264	542
15	3.082	26,804	**99**	1.086	2,964	**183**	0.259	533
16	3.060	26,011	**100**	1.068	2,898	**184**	0.255	524
17	3.038	25,245	**101**	1.051	2,835	**185**	0.251	516
18	3.016	24,505	**102**	1.033	2,773	**186**	0.247	508
19	2.994	23,789	**103**	1.016	2,713	**187**	0.243	501
20	2.972	23,096	**104**	0.999	2,655	**188**	0.239	494
21	2.949	22,427	**105**	0.983	2,597	**189**	0.235	487
22	2.926	21,779	**106**	0.966	2,542	**190**	0.231	480
23	2.903	21,153	**107**	0.950	2,488	**191**	0.228	473
24	2.879	20,547	**108**	0.934	2,436	**192**	0.224	467
25	2.856	19,960	**109**	0.918	2,385	**193**	0.220	461
26	2.832	19,393	**110**	0.903	2,335	**194**	0.217	456
27	2.808	18,843	**111**	0.888	2,286	**195**	0.213	450
28	2.784	18,311	**112**	0.873	2,239	**196**	0.210	445
29	2.759	17,796	**113**	0.858	2,192	**197**	0.206	439
30	2.735	17,297	**114**	0.843	2,147	**198**	0.203	434
31	2.710	16,814	**115**	0.829	2,103	**199**	0.200	429
32	2.685	16,346	**116**	0.815	2,060	**200**	0.197	424
33	2.660	15,892	**117**	0.801	2,018	**201**	0.194	419
34	2.634	15,453	**118**	0.787	1,977	**202**	0.191	415
35	2.609	15,027	**119**	0.774	1,937	**203**	0.188	410
36	2.583	14,614	**120**	0.761	1,898	**204**	0.185	405
37	2.558	14,214	**121**	0.748	1,860	**205**	0.182	401
38	2.532	13,826	**122**	0.735	1,822	**206**	0.179	396
39	2.506	13,449	**123**	0.723	1,786	**207**	0.176	391
40	2.480	13,084	**124**	0.710	1,750	**208**	0.173	386
41	2.454	12,730	**125**	0.698	1,715	**209**	0.171	382
42	2.428	12,387	**126**	0.686	1,680	**210**	0.168	377
43	2.402	12,053	**127**	0.674	1,647	**211**	0.165	372
44	2.376	11,730	**128**	0.663	1,614	**212**	0.163	367
45	2.349	11,416	**129**	0.651	1,582	**213**	0.160	361
46	2.323	11,112	**130**	0.640	1,550	**214**	0.158	356
47	2.296	10,816	**131**	0.629	1,519	**215**	0.155	350
48	2.270	10,529	**132**	0.618	1,489	**216**	0.153	344
49	2.244	10,250	**133**	0.608	1,459	**217**	0.151	338
50	2.217	9,979	**134**	0.597	1,430	**218**	0.148	332
51	2.191	9,717	**135**	0.587	1,401	**219**	0.146	325
52	2.165	9,461	**136**	0.577	1,373	**220**	0.144	318
53	2.138	9,213	**137**	0.567	1,345	**221**	0.142	311
54	2.112	8,973	**138**	0.557	1,318	**222**	0.140	304
55	2.086	8,739	**139**	0.548	1,291	**223**	0.138	297
56	2.060	8,511	**140**	0.538	1,265	**224**	0.135	289
57	2.034	8,291	**141**	0.529	1,240	**225**	0.133	282
58	2.008	8,076	**142**	0.520	1,214			

Table 17 – Temperature vs Resistance Values for the DTT Thermistor (86K at 25°C Resistors)

Degree C	Degree F	Resistance (k Ohms)
–40	–40	2889.60
–35	–31	2087.22
–30	–22	1522.20
–25	–13	1121.44
–20	–4	834.72
–15	5	627.28
–10	14	475.74
–5	23	363.99
0	32	280.82
5	41	218.41
10	50	171.17
15	59	135.14
20	68	107.44
25	77	86.00
30	86	69.28
35	95	56.16
40	104	45.81
45	113	37.58
50	122	30.99
55	131	25.68
60	140	21.40
65	149	17.91
70	158	15.07
75	167	12.73
80	176	10.79
85	185	9.20
90	194	7.87
95	203	6.77
100	212	5.85
105	221	5.09
110	230	4.45
115	239	3.87
120	248	3.35
125	257	2.92
130	266	2.58
135	275	2.28
140	284	2.02
145	293	1.80
150	302	1.59
155	311	1.39
160	320	1.25
165	329	1.12
170	338	1.01
175	347	0.92
180	356	0.83

Table 18 – Pressure (psig) vs. Voltage Drop Values for Suction Pressure Transducers

PRESSURE (psig)	VOLTAGE DROP (V)		PRESSURE (psig)	VOLTAGE DROP (V)		PRESSURE (psig)	VOLTAGE DROP (V)		PRESSURE (psig)	VOLTAGE DROP (V)
0	0.465		**68**	1.135		**136**	1.804		**204**	2.474
2	0.485		**70**	1.154		**138**	1.824		**206**	2.493
4	0.505		**72**	1.174		**140**	1.844		**208**	2.513
6	0.524		**74**	1.194		**142**	1.863		**210**	2.533
8	0.544		**76**	1.214		**144**	1.883		**212**	2.553
10	0.564		**78**	1.233		**146**	1.903		**214**	2.572
12	0.583		**80**	1.253		**148**	1.922		**216**	2.592
14	0.603		**82**	1.273		**150**	1.942		**218**	2.612
16	0.623		**84**	1.292		**152**	1.962		**220**	2.631
18	0.642		**86**	1.312		**154**	1.982		**222**	2.651
20	0.662		**88**	1.332		**156**	2.001		**224**	2.671
22	0.682		**90**	1.351		**158**	2.021		**226**	2.690
24	0.702		**92**	1.371		**160**	2.041		**228**	2.710
26	0.721		**94**	1.391		**162**	2.060		**230**	2.730
28	0.741		**96**	1.410		**164**	2.080		**232**	2.749
30	0.761		**98**	1.430		**166**	2.100		**234**	2.769
32	0.780		**100**	1.450		**168**	2.119		**236**	2.789
34	0.800		**102**	1.470		**170**	2.139		**238**	2.809
36	0.820		**104**	1.489		**172**	2.159		**240**	2.828
38	0.839		**106**	1.509		**174**	2.178		**242**	2.848
40	0.859		**108**	1.529		**176**	2.198		**244**	2.868
42	0.879		**110**	1.548		**178**	2.218		**246**	2.887
44	0.898		**112**	1.568		**180**	2.237		**248**	2.907
46	0.918		**114**	1.588		**182**	2.257		**250**	2.927
48	0.938		**116**	1.607		**184**	2.277		**252**	2.946
50	0.958		**118**	1.627		**186**	2.297		**254**	2.966
52	0.977		**120**	1.647		**188**	2.316		**256**	2.986
54	0.997		**122**	1.666		**190**	2.336		**258**	3.005
56	1.017		**124**	1.686		**192**	2.356		**260**	3.025
58	1.036		**126**	1.706		**194**	2.375		**262**	3.045
60	1.056		**128**	1.726		**196**	2.395		**264**	3.065
62	1.076		**130**	1.745		**198**	2.415		**266**	3.084
64	1.095		**132**	1.765		**200**	2.434		**268**	3.104
66	1.115		**134**	1.785		**202**	2.454		**270**	3.124

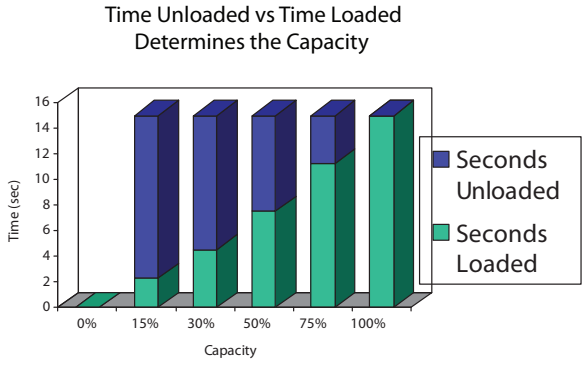
MAJOR SYSTEM COMPONENTS

General

The 48/50PD single package rooftop units contain the *Comfort*Link™ electronic control system that monitors all operations of the rooftop. The control system is composed of several main control components and available factory-installed options or field-installed accessories as listed in sections below. See Fig. 13-15 for the control and power schematics for 48/50PD. Fig. 16 shows the layout of the control box, unit, and thermistor and transducer locations for the 48/50PD.

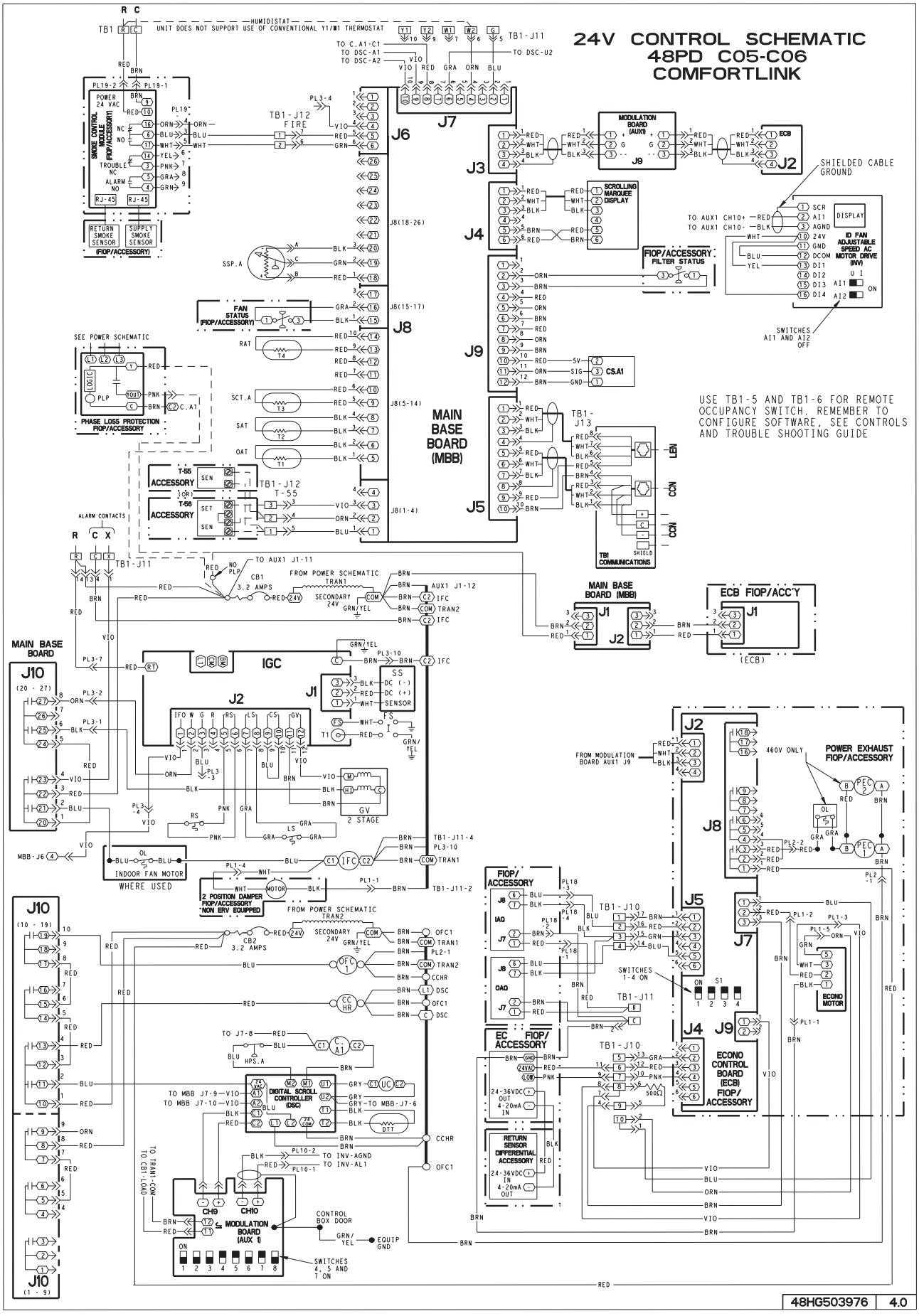
Digital Scroll Compressor

These units are equipped with a Copeland Digital Scroll Compressor that can vary the refrigerant capacity between 100 and 15%. This is accomplished by a mechanism in the compressor that separates the two scroll spirals which stops the pumping of the refrigerant gas. This mechanism is operated by the differential pressure between the suction and discharge of the compressor. The pressure to operate the unloading mechanism is controlled by a small solenoid situated in a refrigerant line between the top of the compressor and the suction line. When the solenoid is energized, the compressor is unloaded. The solenoid coil is controlled by the Copeland Digital Scroll Controller (DSC) that operates on a 1 to 5V signal from the *Comfort*Link™ Auxiliary Board (AUX1) and converts this into a Pulse Width Modulated (PWM) signal to the solenoid valve. The pulse width modulated signal is an on and off signal that repeats every 15 seconds with the off time portion of the 15 seconds representing the % loading of the compressor. Fig. 12 shows the PWM signal to the solenoid which represents the actual running capacity of the compressor.



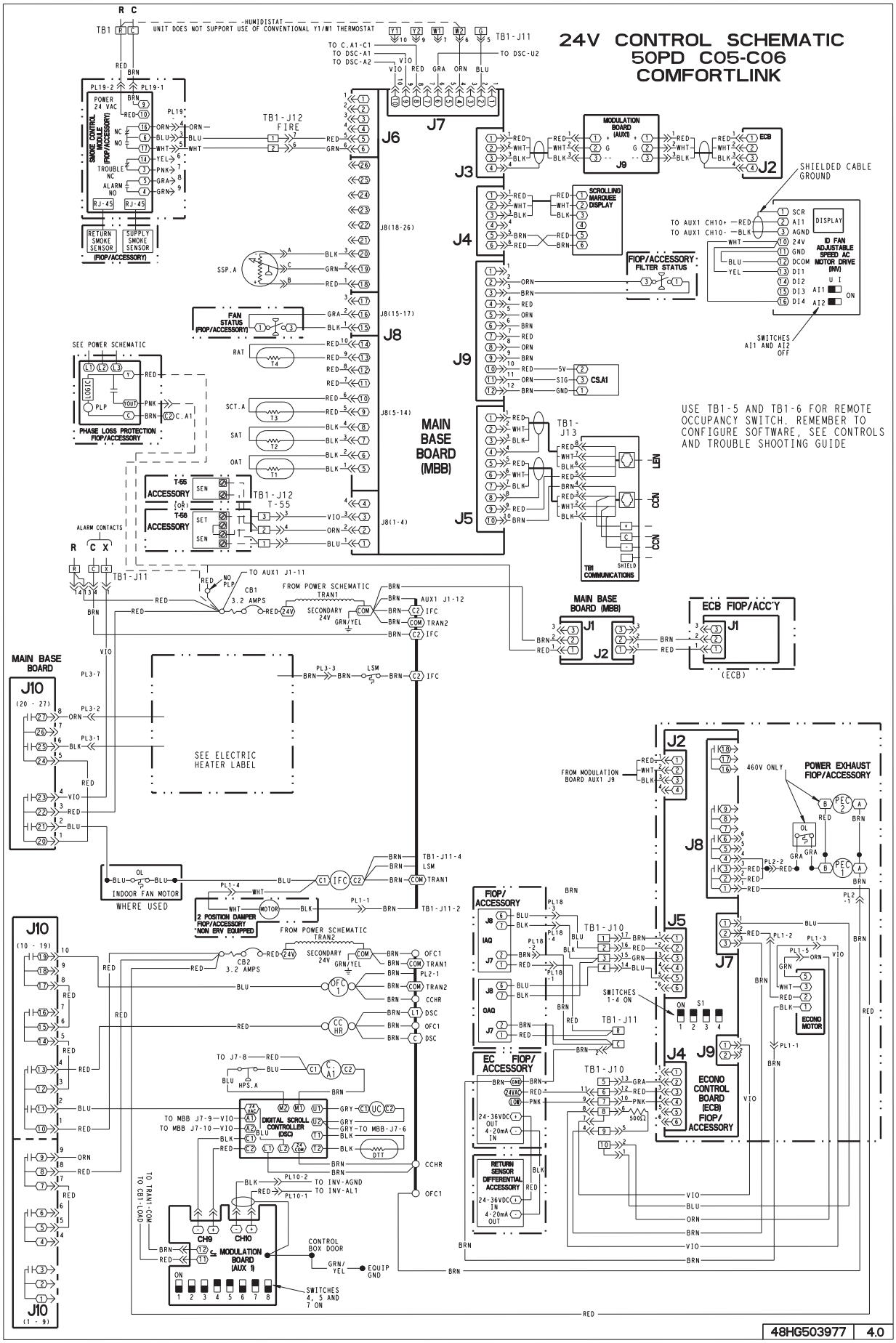
C09247

Fig. 12 - Pulse Width Modulated Signal



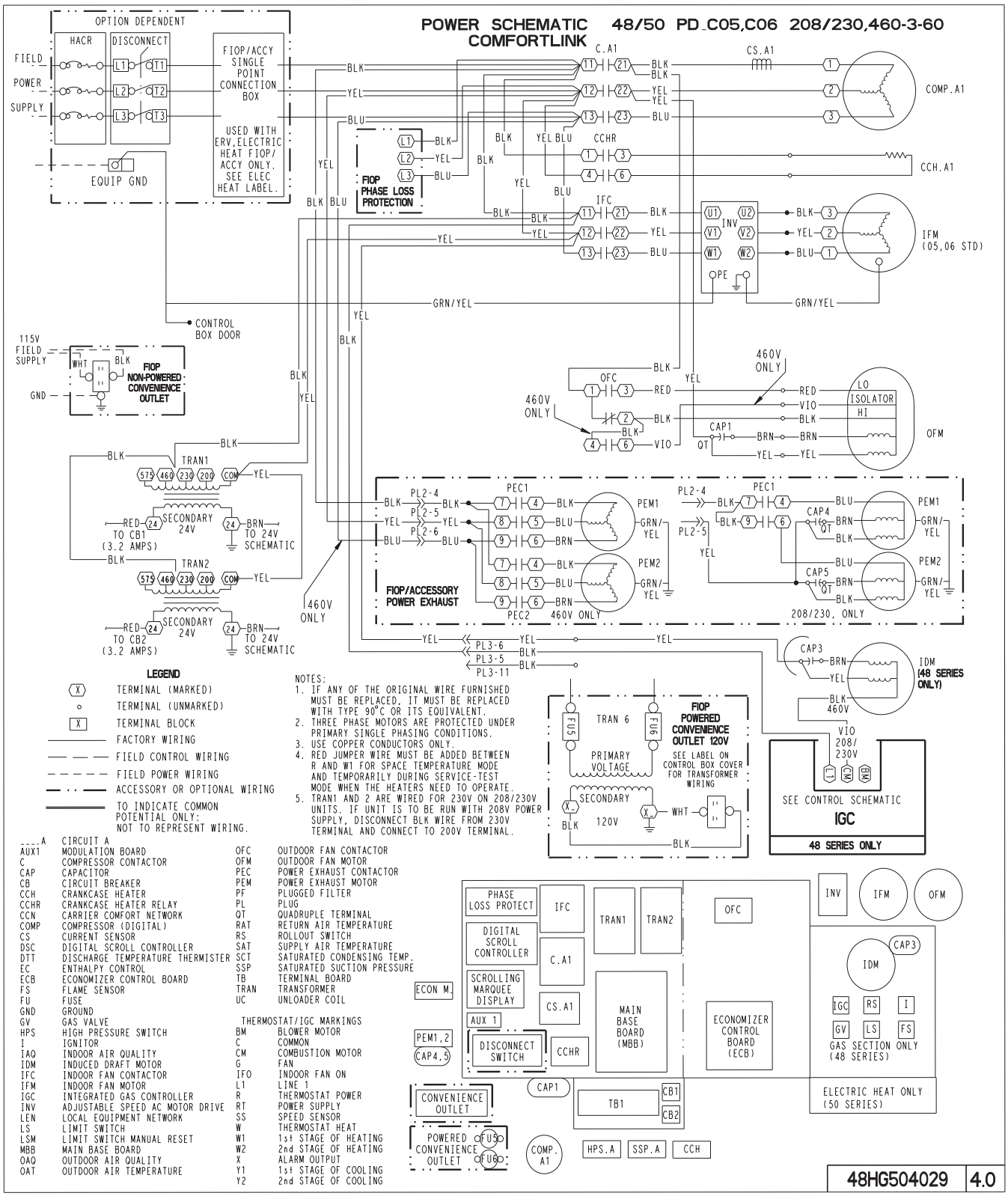
C08582

Fig. 13 - 48PD Control Wiring Schematic



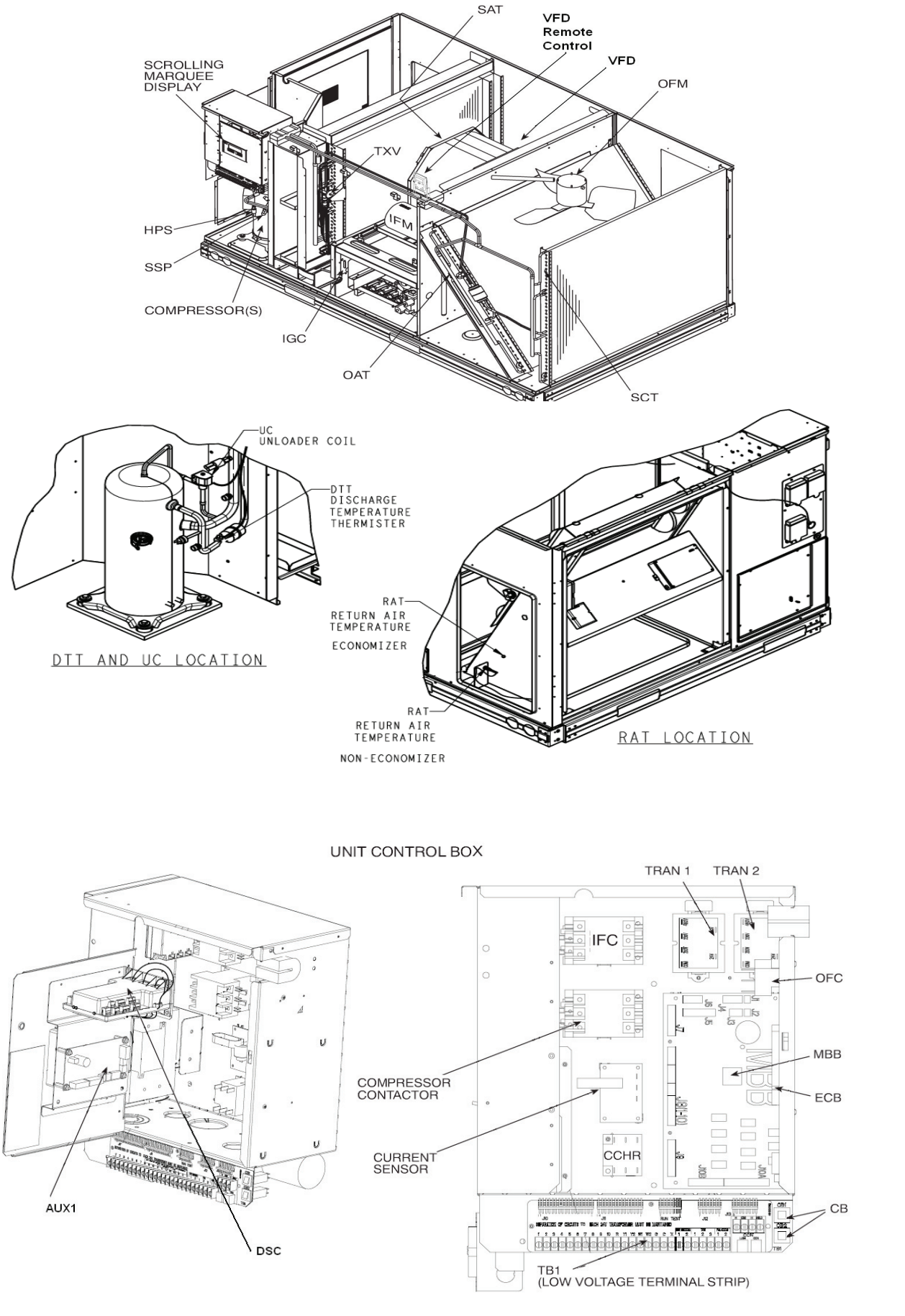
C08583

Fig. 14 - 50PD Control Wiring Schematic



C08584

Fig. 15 - 48/50PD Power Wiring Schematic and Legend



C08657

Fig. 16 – Typical Unit Component Arrangement

Main Base Board (MBB)

See Fig. 17 and Table 19. The MBB is the center of the *Comfort*Link control system. It contains the major portion of the operating software and controls the operation of the unit. The MBB continuously monitors input/output channel information received from its inputs and from the Economizer Control Board (ECB). The MBB receives inputs from thermistors and transducers. The MBB also receives the Current Sensor inputs for compressors and other discrete or digital inputs. The MBB reads space temperature (SPT) from either a T-55, T-56 or T-58 device and space temperature offset (SPTO) from a T-56 device. See Field-Installed Accessories section. The MBB controls 9 relays.

IMPORTANT: The Main Base Board (MBB) has a 3-position instance jumper that is factory set to '1.' **Do not change this setting.**

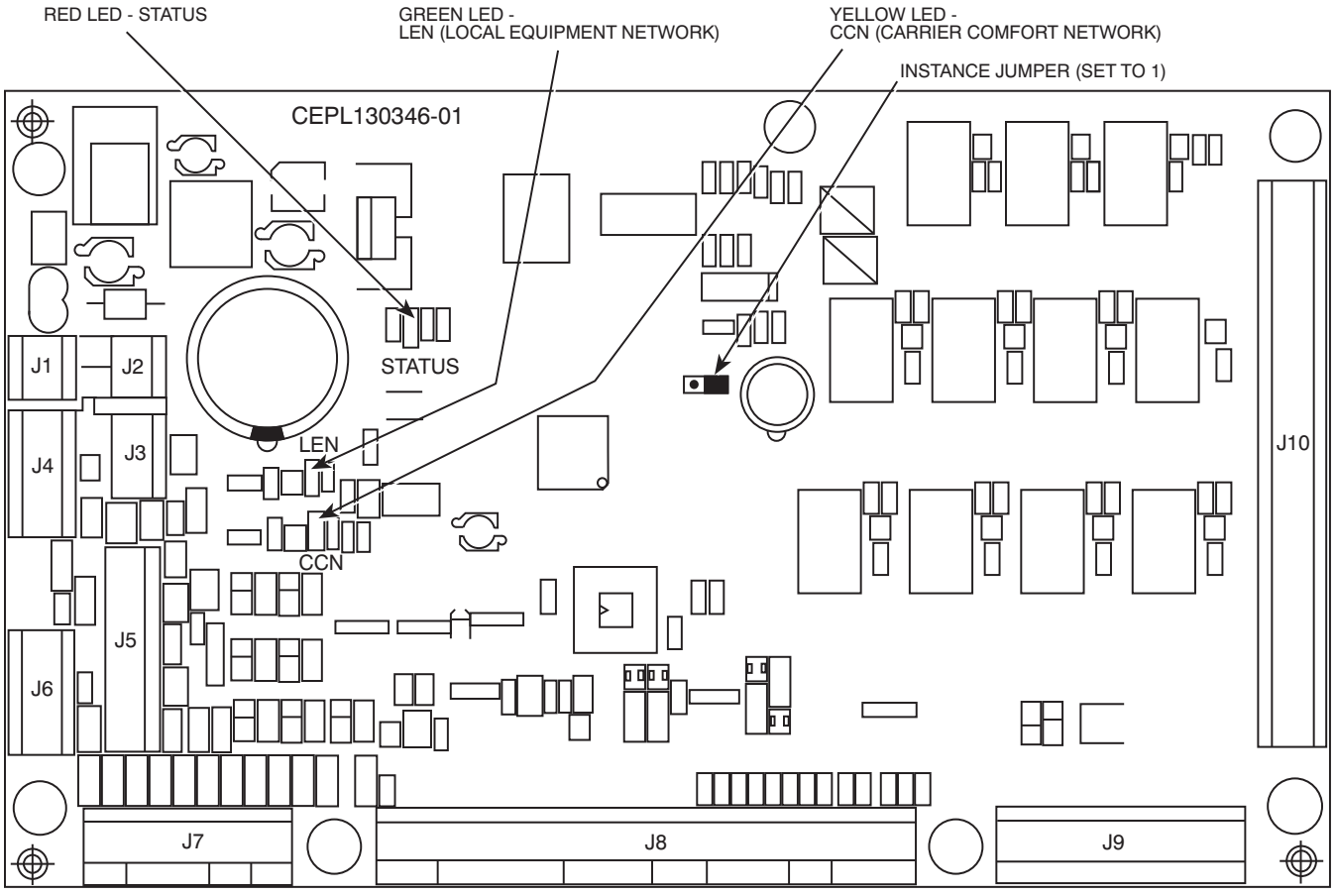


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Fig. 17 - Main Base Board (MBB)

Table 19 – MBB Connections

DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
		INPUTS		
	Input power from TRAN1	control box	24 VAC	J1, 1–3
	IGC Fan Request	gas section	switch input	J6, 4
FDWN	Fire shutdown switch	supply/return/space	switch input	J6, 6
HUM	Space Humidity switch	space	switch input	J7, 4
	Digital Scroll Unloader		switch input	J7, 6
C.ALM	Scroll Compressor Alarm		switch input	J7, 8
CMP.A	Compressor A Feedback		switch input	J7, 10
FIL.S	Filter status switch	indoor fan section	switch input	J9, 2–3
CS.A1	Compressor A1 Current Sensor	control box	0–5vdc digital input	J9, 10–12
SPT	Space temperature (T55/56)	space	10k thermistor	J8, 1–2
SPTO	Space temperature offset (T56)	space	10k thermistor	J8, 2–3
OAT	Outdoor air temperature	outdoor coil support	10k thermistor	J8, 5–6
SAT	Supply air temperature	indoor fan housing, or supply duct	10k thermistor	J8, 7–8
SCT.A	Saturated condenser temperature, circuit A	outdoor coil, circuit A	5k thermistor	J8, 9–10
RAT	Return air temperature	Return air Section	10k thermistor	J8, 13–14
FAN.S	Fan status switch	indoor fan section	switch input	J8, 15–16
SSP.A	Suction pressure, circuit A	compressor A suction	0–5 VDC pressure transducer	J8, 18–20
		OUTPUTS		
CTLR	Digital Scroll Ctrl Pwr		relay	J10, 11
CCH	Crankcase heat relay		relay	J10, 13
OFC.1	Outdoor fan 1 relay		relay	J10, 19
IDF	Indoor fan VFD pwr relay		relay	J10, 21
ALRM	Alarm relay		relay	J10, 23
HT.1	Heat Stage 2 relay		relay	J10, 25
HT.2	Heat Stage 1 relay		relay	J10, 27
		COMMUNICATION		
	Local Equipment Network (LEN)		communication	J5, 1–3
	Carrier Comfort Network (CCN)		communication	J5, 5–7
	Network device power		24 VAC	J5, 9–10
	Scrolling Marquee Display (LEN)		communication	J4, 1–3
	Scrolling Marquee Display power		24 VAC	J4, 5–6
	Modulation Board (AUX1) LEN		communication	J3, 1–3
	Optional ECB power		24 VAC	J2, 1–2

Economizer Control Board (ECB)

The ECB controls the economizer actuator. (See Fig. 18 and Table 20.) The control signal from the ECB uses either the MFT (Multi-Function Technology) digital communication protocol or a 4 to 20 mA output signal as defined by the configuration ***Configuration→ECON→E.CTL***. The ECB has inputs for Indoor Air Quality (IAQ), Outdoor Air Quality (OAQ), enthalpy and RH sensor. It also controls two power exhaust outputs.

By digitally communicating with the ECB, the economizer actuator is able to provide the damper position and diagnostic information to the *Comfort*Link controller. The damper position is displayed at ***Outputs→ECON→ECAP***. Diagnostic information is displayed via Alert T414. More information about these alarms is contained in the Alarms and Alerts section.

IMPORTANT: The Economizer Control Board (ECB) has a 4-position DIP switch that is factory set to '0' (ON, towards the center of the board). **Do not change this setting.**

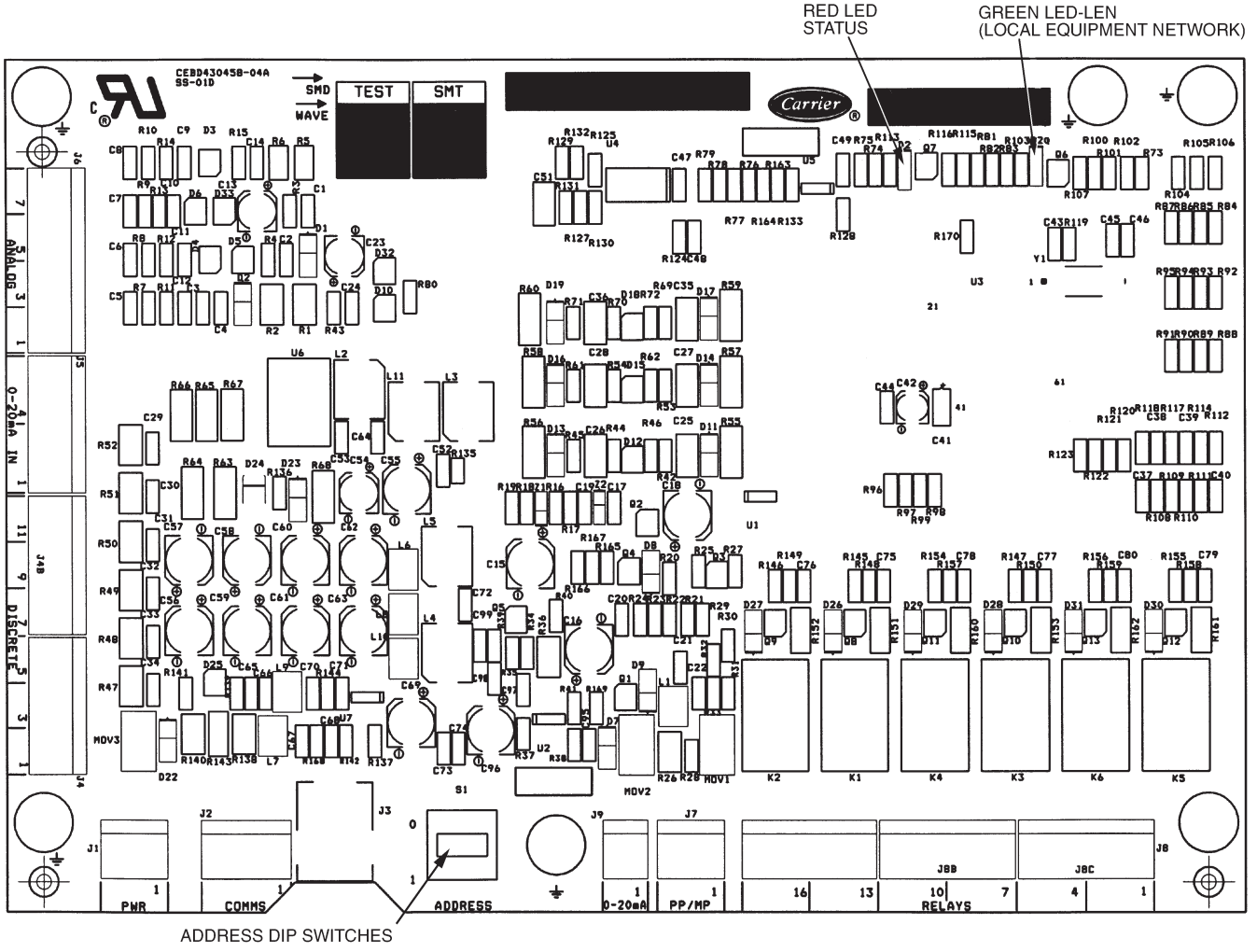

Fig. 18 – Economizer Control Board (ECB)

Table 20 – ECB Connections

DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
	Input power from MBB	control box	24 VAC	J1, 1 – 2
RM.OC	Remote occupancy switch	field installed	switch input	J4, 2
ENTH or IAQ.S	Outdoor enthalpy switch, or Indoor air quality switch	economizer, or return/space	switch input	J4, 4
IAQ	Indoor air quality sensor	return/space	0 – 20 mA	J5, 2
OAQ or SP.RH	Outdoor air quality sensor, or Relative humidity sensor	field installed	0 – 20 mA	J5, 5
	Sensor Common		Ground	J5, 3
	Actuator Common		Ground	J7, 3
OUTPUTS				
	Output power to enthalpy switch		24 VAC	J4, 3
	Output power for loop power sensors		24 VDC	J5, 1
	Output power to economizer actuator		24 VAC	J7, 2
PE.1	Power exhaust 1 relay		relay	J8, 3
PE.2	Power exhaust 2 relay		relay	J8, 6
EC.CP	Commanded Economizer position		0 – 20 mA	J9, 1
COMMUNICATION				
	Local Equipment Network (LEN)		communication	J2, 1 – 3
	Carrier Comfort Network (CCN)		communication	J3
EC.CP & EC.AP	Economizer actuator position (digital control)		MFT communication	J7, 1

Modulation Board (AUX1)

The AUX1 board controls the compressor capacity and the indoor fan speed (See Fig. 19 and Table 21.) It outputs a 1-5vdc and a 2-10vdc signal to the DSC and VFD for capacity and fan speed, respectively. This board is also used as the LEN connection buss for the ECB, therefore must be operational for the ECB to communicate.

IMPORTANT: The AUX1 board has an 8-position DIP switch (S1) that is factory set for its LEN address. All the switches must be in the off position except 4, 5 and 7 which are on (off is towards the center of the board). **Do not change this setting**.

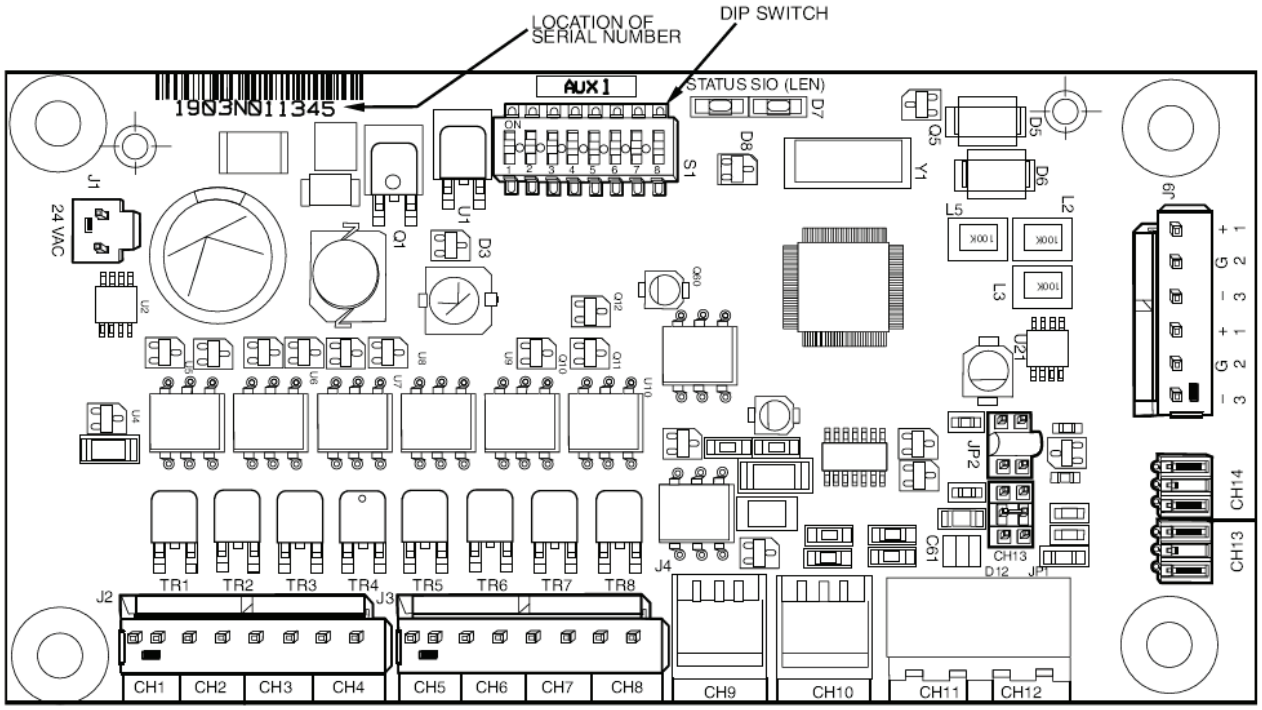

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Fig. 19 - Modulation Board (AUX1)

Table 21 – AUX1 Connections

DISPLAY NAME	POINT DESCRIPTION	TYPE OF I/O	CONNECTION PIN NUMBER
	OUTPUTS		
	Input power from TRAN1	24 VAC	J1, 11–12
CAPC	Compressor Capacity	1–5vdc	CH9
F.SPD	Commanded Fan Speed	2–10vdc	CH10
	COMMUNICATION		
	Local Equipment Network (LEN)	communication	J9, 1–3
	Local Equipment Network (LEN)	communication	J9, 1–3

Digital Scroll Control Board (DSC)

The DSC board controls the compressor's capacity. (See Fig. 20 and Table 22.) It receives a 1-5vdc signal from the AUX1 board determined by the cooling algorithm.

The DSC has direct control of the compressor and pulses a solenoid unloader on and off to provide a specific capacity. The discharge temperature thermistor (DTT) is monitored by the DSC for compressor safety. The DSC is equipped with an LED (light-emitting diode) for diagnostics. See the troubleshooting section for more details.

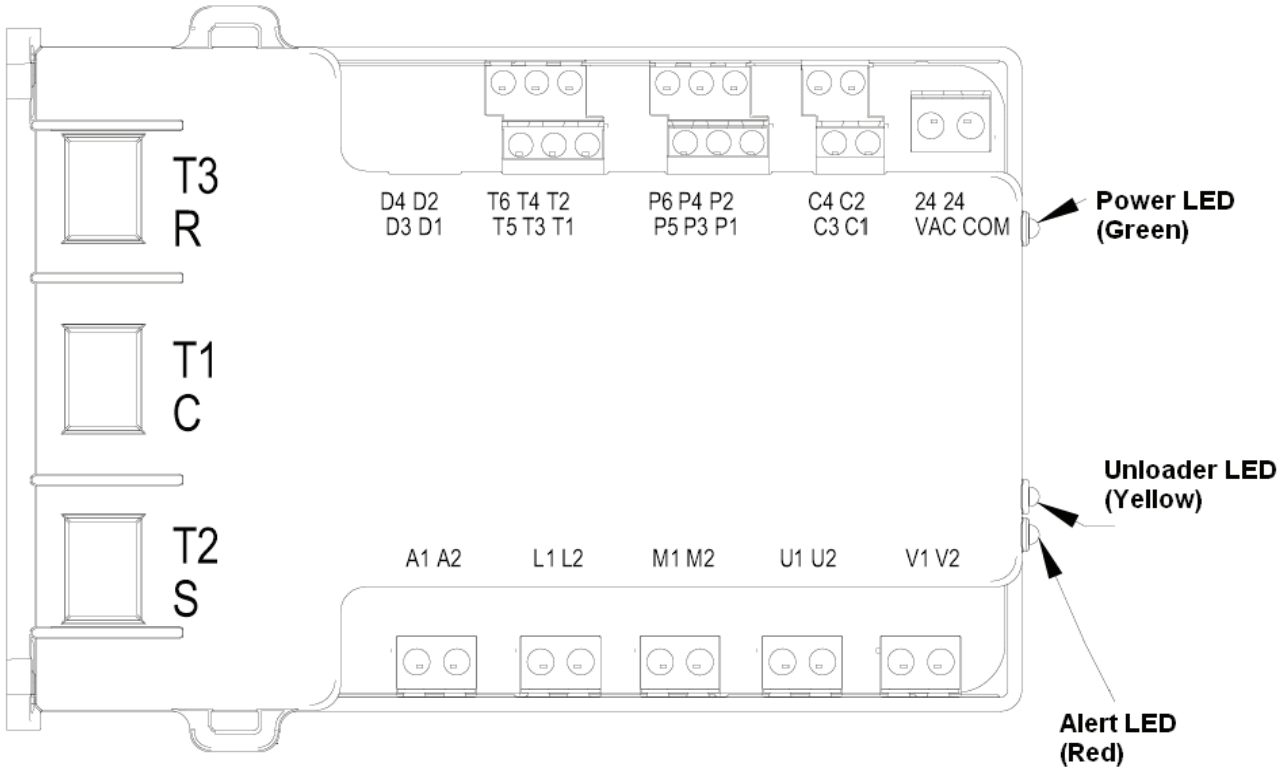

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Fig. 20 - Digital Scroll Controller (DSC)

Table 22 – DSC Connections

DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
CTLR	Digital Scroll Ctrl Pwr		24 VAC	24VAC/24COM
	Compressor Discharge Temperature (DTT)	Discharge line	86k thermistor	T1/T2
CAPC	Compressor Capacity		1–5vdc	C1/C2
	Load Control Power*		19–250VAC	L1/L2
OUTPUTS				
C.ALM	Scroll Compressor Alarm		Relay	A1/A2
CMP.A	Compressor A Feedback		Relay	M1/M2
	Digital Scroll Unloader	Compressor section	Relay	U1/U2

* Voltage used for contacts M1 & M2, U1 & U2, and V1 & V2 (24 VAC used).

Variable Frequency Drive (VFD)

The VFD varies the frequency of the AC voltage supplied to the indoor fan. (See Fig. 21 and Table 23.) This causes the variance in the speed of the fan. The commanded fan speed is received by the VFD from the AUX1 board as a 2-10vdc signal.

The AI1 DIP switch must be in the off (or towards "U") position to properly read the analog signal. There are three jumper wires that must remain installed for proper operation. The VFD is mounted behind the fan housing on the fan sled and the remote keypad is mounted on the front of the fan housing for easy access. The VFD is factory set to the auto mode for unit operation.

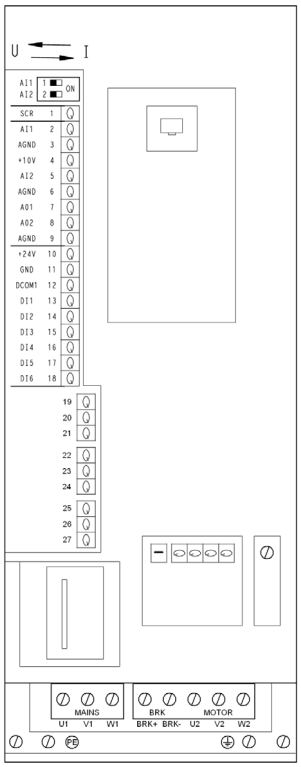

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Fig. 21 - Variable Frequency Drive (VFD)

Table 23 – VFD Connections

DISPLAY NAME	POINT DESCRIPTION	TYPE OF I/O	TERMINAL NUMBER	TERMINAL NAME
	LOW VOLTAGE INPUTS			
	Shielded Cable Ground	Shield	1	SCR
F.SPD	Commanded Fan Speed	2–10vdc	2	AI1*
	Analog Input 1 Common	Ground	3	AGND
	Low Voltage Power (jumped to DI1 & DI4)	24v	10	24v
	Low Voltage Common (jumped to DCOM)	Ground	11	GND
	Discrete Inputs Common (jumped from GND)	Ground	12	DCOM
	Discrete Input 1 (jumped from 24v)	Switch Input	13	DI1
	Discrete Input 4 (jumped from 24v)	Switch Input	16	DI4
	HIGH VOLTAGE			
	Voltage Leg from IFC–21	Voltage Input	U1	MAINS
	Voltage Leg from IFC–22	Voltage Input	V1	MAINS
	Voltage Leg from IFC–23	Voltage Input	W1	MAINS
	Voltage Leg to IFM–3	Voltage Output	U2	MOTOR
	Voltage Leg to IFM–2	Voltage Output	V2	MOTOR
	Voltage Leg to IFM–1	Voltage Output	W2	MOTOR

* Requires the AI1 dip switch to be in in the Off (or towards "U") position.

Integrated Gas Control (IGC) Board

The IGC is provided on gas heat units. (See Fig. 22 and Table 24.) The IGC controls the direct spark ignition system and monitors the rollout switch, limit switch, and induced-draft motor Hall Effect switch.

The IGC is equipped with an LED (light-emitting diode) for diagnostics. See the Troubleshooting section for more information.

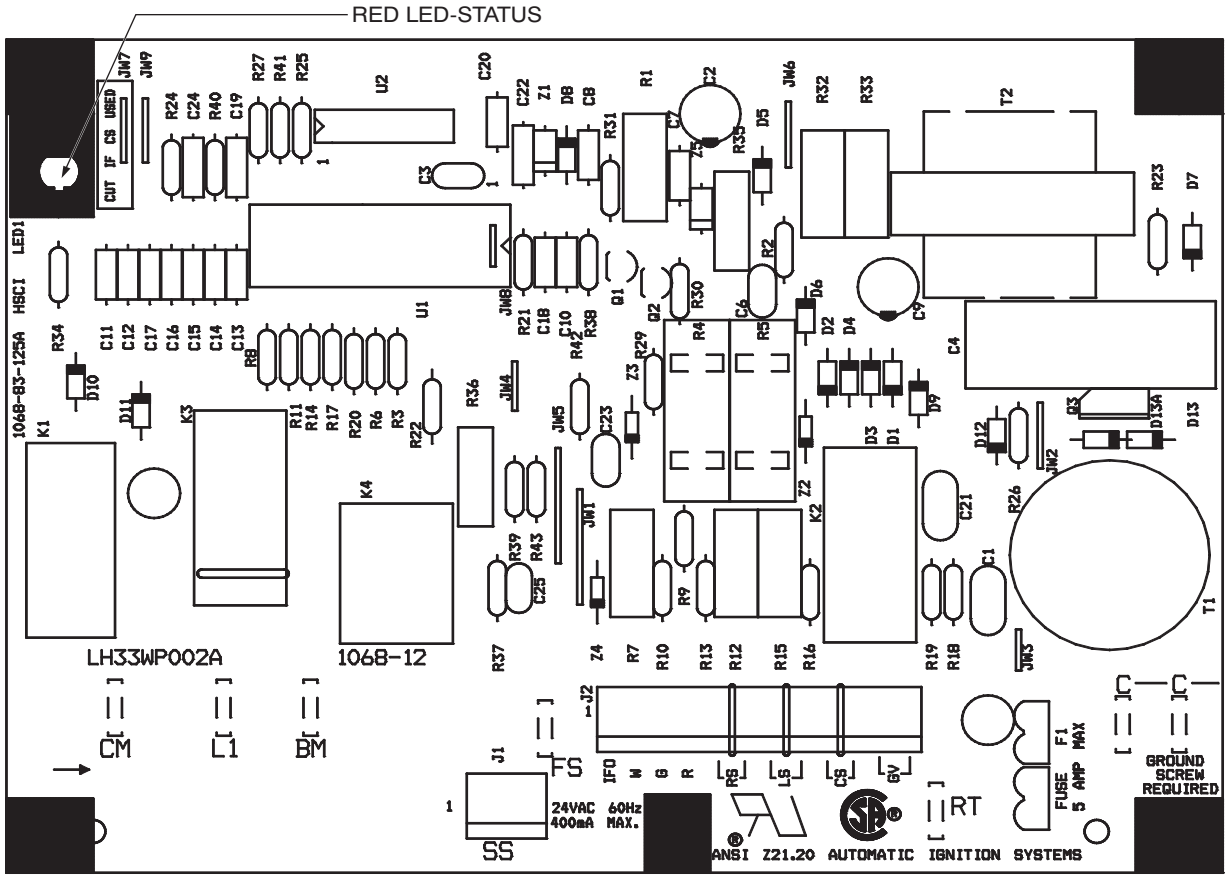

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Fig. 22 - Integrated Gas Control (IGC) Board

Table 24 – IGC Connections

TERMINAL LABEL	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
RT, C	Input power from TRAN 1	control box	24 VAC	
SS	Speed sensor	gas section	analog input	J1, 1–3
FS, T1	Flame sensor	gas section	switch input	
W	Heat stage 1	MBB	24 VAC	J2, 2
RS	Rollout switch	gas section	switch input	J2, 5–6
LS	Limit switch	gas section	switch input	J2, 7–8
CS	Centrifugal switch (not used)		switch input	J2, 9–10
OUTPUTS				
L1, CM	Induced draft combustion motor	gas section	line VAC	
IFO	Indoor fan request	control box	relay	J2, 1
GV (W1)	Gas valve (heat stage 1)	gas section	relay	J2, 12
GV (W2)	Gas Valve (heat stage 2, from MBB)	gas section	Not on IGC	

Low Voltage Terminal Strip

(TB1)

This circuit board provides a connection point between the major control boards and a majority of the field-installed accessories. (See Fig. 23 and Table 25.)

The circuit breakers for the low voltage control transformers, interface connection for the Carrier Comfort Network® (CCN) communication, and interface connection for the Local Equipment Network (LEN) communications are also located on the low voltage terminal strip.

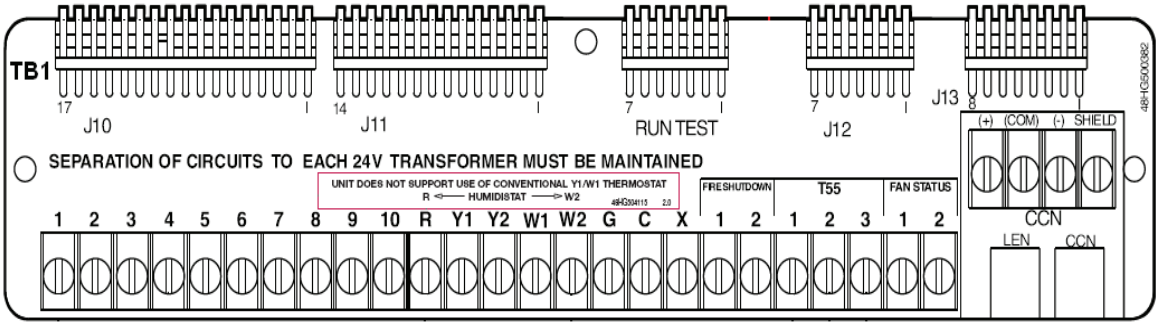

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Fig. 23 - Low-Voltage Terminal Board (LVTB)

Table 25 – Field Connection Terminal Strip

TERMINAL LABEL	DISPLAY NAME	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
1		24 VDC Sensor Loop power		24 VDC output	J10, 17
2	IAQ	Indoor air quality sensor	return/space	4–20 mA input	J10, 16
3		Air quality & humidity sensor common		Ground	J10, 15
4	OAQ or SP.RH	Outdoor air quality sensor or Relative humidity sensor	field installed	4–20 mA input	J10, 14
5	RM.OC	Remote occupancy switch	field installed	24 VAC input	J10, 13
6		Switch power (ENTH, RM.OC, IAQ.S)		24 VAC output	J10, 11–12
7	ENTH or IAQ.S	Outdoor enthalpy switch, or Indoor air quality switch	economizer, or return/space	24 VAC input	J10, 9–10
8*	EC.CP	Economizer commanded position actuator (when in digital control)	economizer	2–10 VDC output	J10, 6–8
9		Economizer signal common		Ground	J10, 3–5
10*	EC.AP	Economizer position feedback (when in analog control)	economizer	communication 2–10 VDC output	J10, 1–2
R		24 VAC power		24 VAC output	J11, 11–14
Y1		NOT USED			J11,10
Y2		NOT USED			J11, 9
W1		NOT USED			J11, 7–8
W2	HUM	Space Humidity Switch	space	24 VAC input	J11, 6
G		NOT USED			J11, 5
C		24 VAC common		24 VAC output	J11, 2–4
X	ALRM	Alarm output (normally open)		24 VAC output	J11, 1
FIRE SHUTDOWN 1	FDWN	Fire shutdown switch 24 VAC output	supply/return	switch input	J12, 7
FIRE SHUTDOWN 2	FDWN	Fire shutdown switch input	supply/return	switch input	J12, 6
T55 1–2	SPT	Space temperature (T55/56)	space	10k thermistor	J12, 4–5
T55 2–3	SPTO	Space temperature offset (T56)	space	10k thermistor	J12, 3–4
FAN STATUS 1–2		NOT USED			J12, 1–2
LEN		Local Equipment Network (LEN)		communication	J13, 1–3, 4–5
CCN		Carrier Comfort Network (CCN)		communication	J13, 6–8, 4–5

* Refer to Third Party Control section for more information

Scrolling Marquee Display

This device is the keypad interface used to access rooftop information, read sensor values, and test the unit. (See Fig. 24.) The Scrolling Marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Basic Control Usage section for further details.

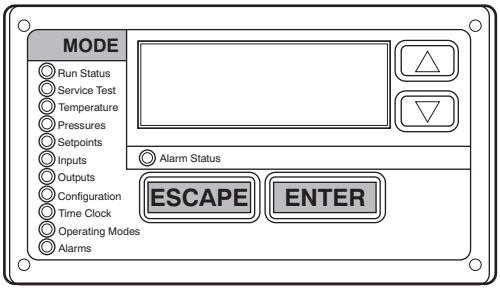

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Fig. 24 - Scrolling Marquee

Accessory Navigator™ Display

The accessory hand-held Navigator display can be used with 48/50PD units. (See Fig. 25.) The Navigator display operates the same way as the Scrolling Marquee device. The Navigator display plugs into the LEN port on either TB or the ECB board.

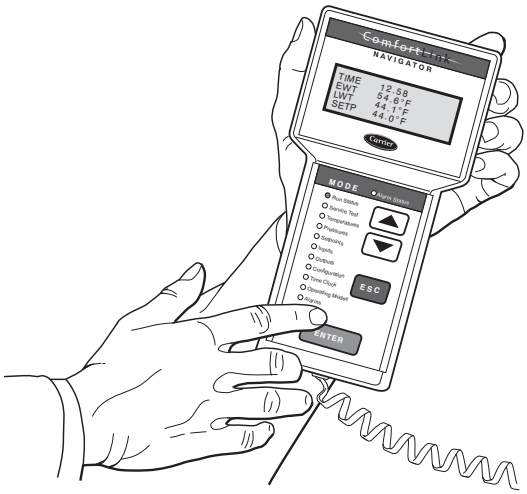

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Fig. 25 - Accessory Navigator™ Display

Carrier Comfort Network (CCN)® Interface

The units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is field supplied and installed. The system elements are connected to the communication bus in a daisy chain arrangement. (See Fig. 26.) The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at TB. (See Fig. 26.) Consult the CCN Contractor's Manual for further information.

IMPORTANT: Conductors and drain wire must be 20 AWG (American Wire Gauge) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -20°C to 60°C is required. See Table below for acceptable wiring.

MANUFACTURER	PART NO.
Alpha	2413 or 5463
Belden	8772
Carol	C2528
West Penn	302

It is important when connecting to a CCN communication bus that a color-coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. The shield screw on TB1 can be used to tie the cables together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. The shield screw on TB1 is not acceptable for grounding. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (-) conductors. (Substitute appropriate colors for different colored cables).
3. Connect the red wire to (+) terminal on TB1, the white wire to COM terminal, and the black wire to the (-) terminal.
4. The RJ14 CCN connector on TB1 can also be used, but is only intended for temporary connection (for example, a laptop computer running Carrier network software).
5. Restore power to unit.

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

Field-Installed Accessories

Space Temperature Sensor (T-55)

The T-55 space temperature sensor (part no. 33ZCT55SPT) is a field-installed accessory. The sensor is installed on a building interior wall to measure room air temperature. The T-55 sensor also includes an override button on the front cover to permit occupants to override the Unoccupied Schedule (if programmed).

TB1-T55-1 . . . . . Sensor Input

TB1-T55-2 . . . . . Sensor Common

Space Temperature Sensor (T-56)

The T-56 space temperature sensor (part no. 33ZCT56SPT) is a field-installed accessory. This sensor includes a sliding scale on the front cover that permits an occupant to adjust the space temperature set point remotely. The T-56 sensor also includes an override button on the front cover to allow occupants to override the unoccupied schedule (if programmed).

TB1-T55-1 . . . . . Sensor Input

TB1-T55-2 . . . . . Sensor Common

TB1-T55-3 . . . . . Setpoint Offset Input

Space Temperature Sensor (T-58)

The T-58 space temperature sensor (part no. 33ZCT58SPT) is a field-installed accessory. The T-58 sensor communicates with the *Comfort*Link™ controller, providing space temperature, heating and cooling set points, and mode operation information.

Refer to the T-58 installation instructions for information on installing and configuring the T-58 sensor.

Each T-58 sensor must have a unique address on the CCN. Each T-58 sensor must also be configured with the address of the unit control it is communicating to.

Space Temperature Sensor Averaging

See Fig. 27 for space temperature averaging with T-55 sensors only. If the use of one T-56 sensor is required, refer to Fig. 28.

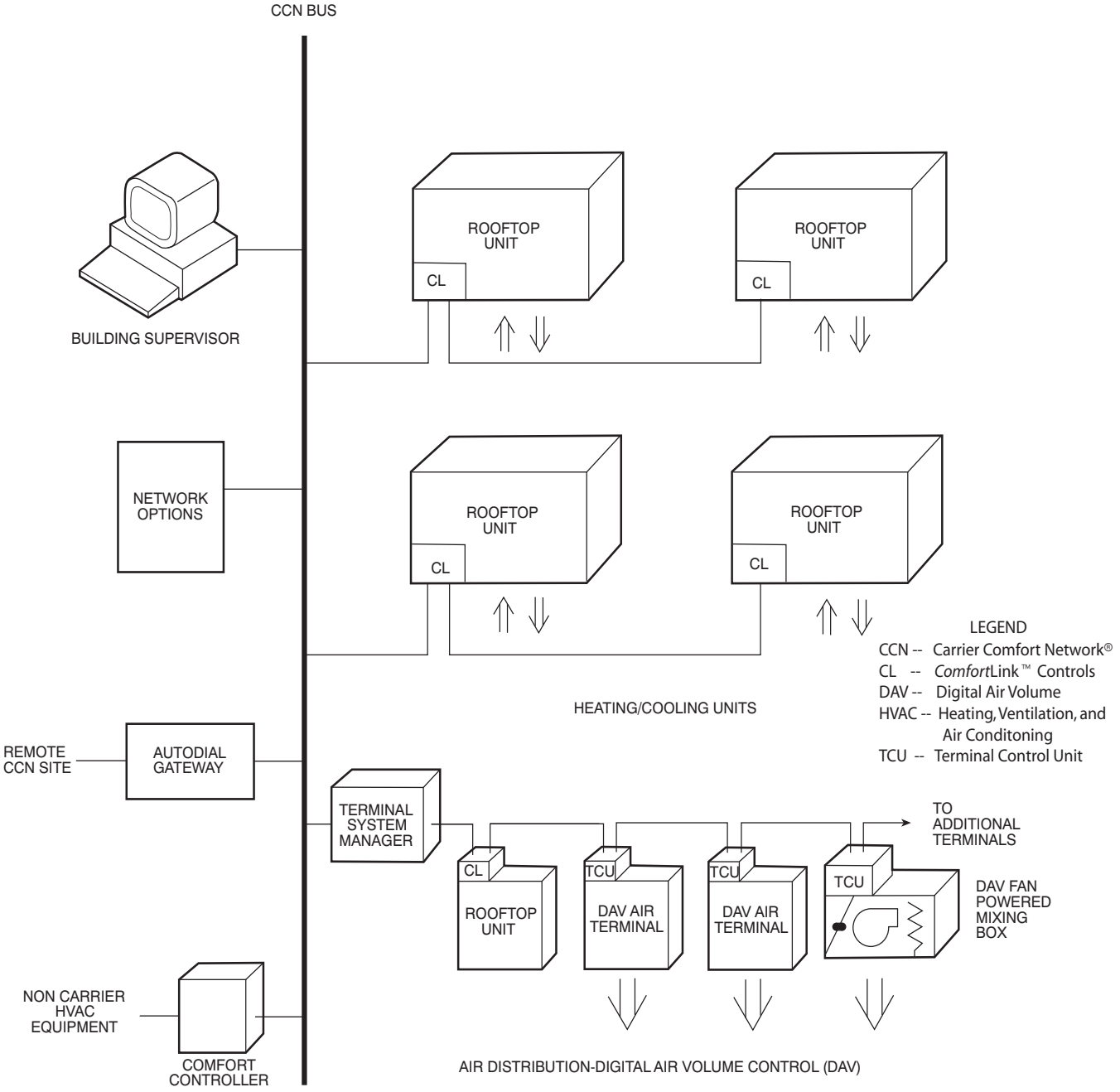


Fig. 26 - CCN System Architecture

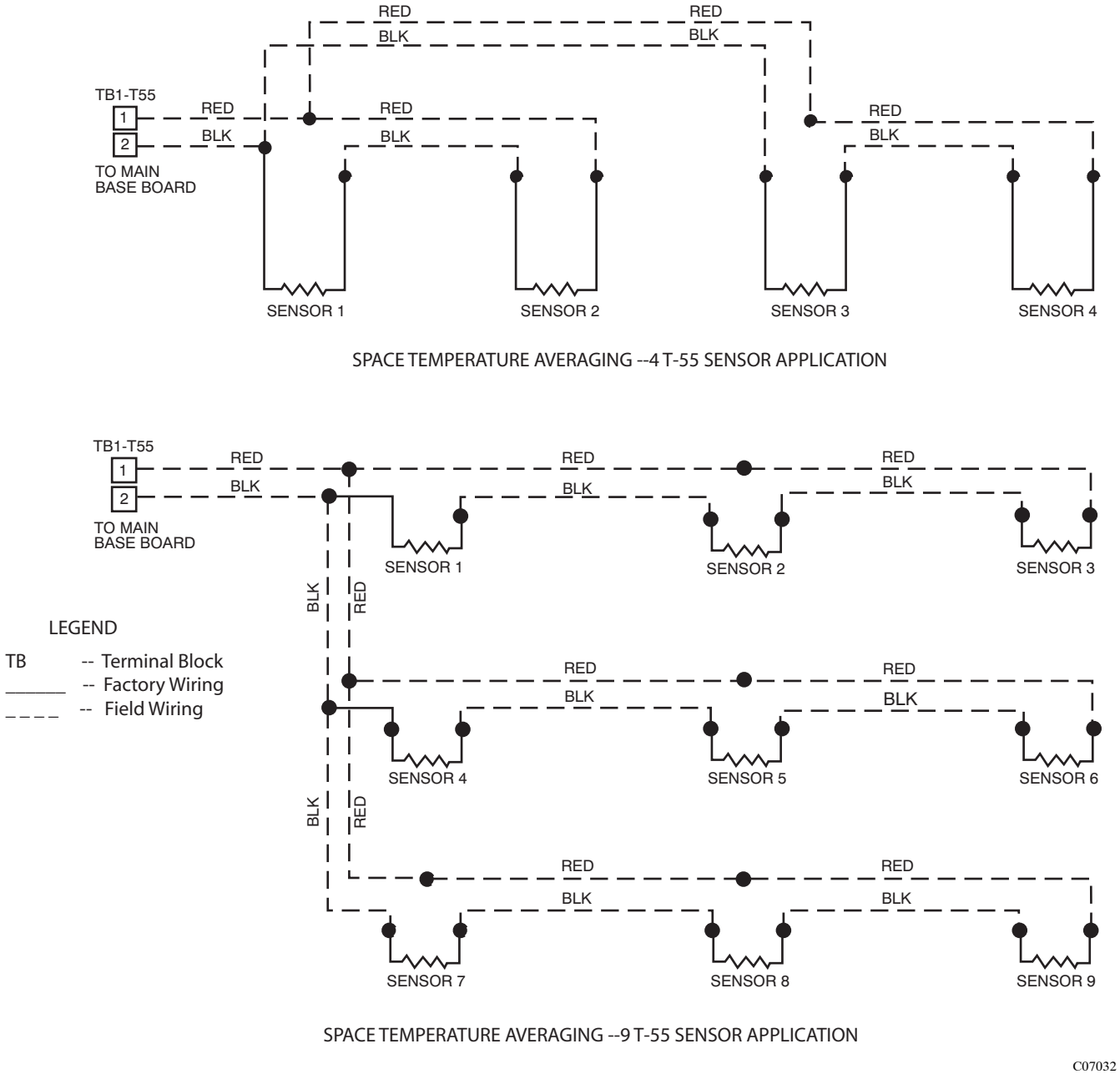


Fig. 27 - Space Temperature Sensor Averaging

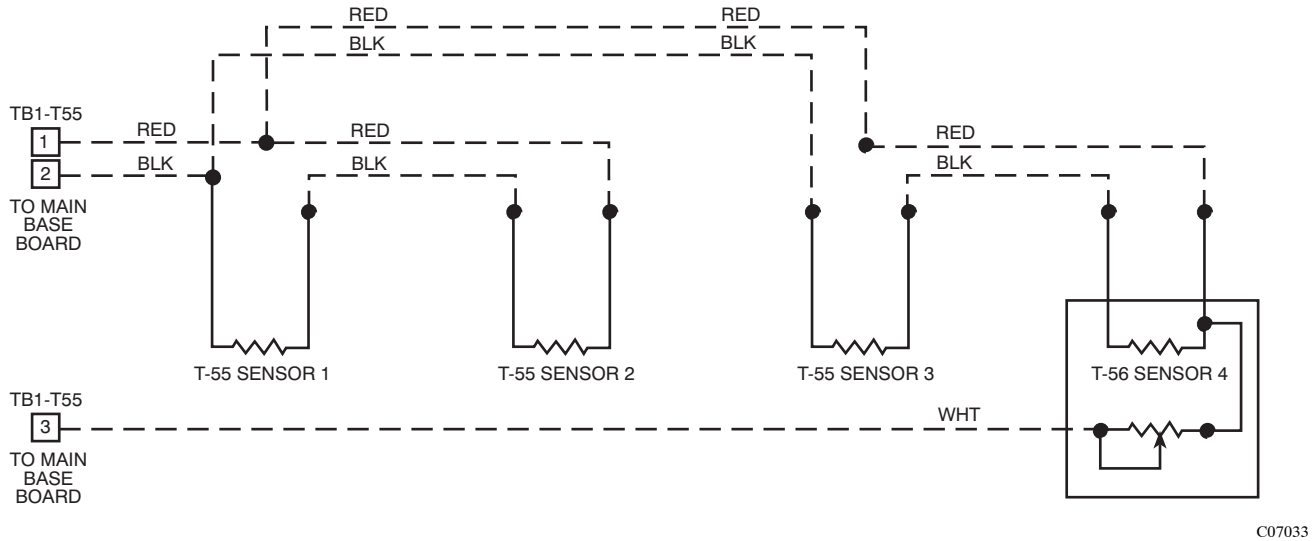


Fig. 28 - Space Temperature Sensor Averaging with 3 T-55 Sensors and One T-56 Sensor

Carrier Accessory Kits

There are specific accessory kits sold for various field installed accessories. These kits vary based on model, size, voltage, manufacture date, and duct orientation. Some of these kits include Economizer, Power Exhaust, and Electric Heat. Refer to the Controls Quick Set-Up section for configuration and more information on these accessories.

Two-Position Damper

The two-position outdoor air damper accessory usage depends on model size and return duct orientation. This accessory wires directly into the low voltage circuit for the indoor fan control. No other control configuration is needed.

Indoor Air Quality

The indoor air quality (IAQ) sensor (part no. 33ZCSENCO2) is a field-installed accessory which measures CO_2 levels in the air. When installing this sensor, an ECB board must be installed and the unit must be configured for IAQ use by setting ***Configuration→AIR.Q→IA.CF*** to a value of 1, 2, or 3. See the Indoor Air Quality section for more information.

TB1-2 . . . . . 4-20 mA Input

TB1-3 . . . . . Sensor Common

TB1-R . . . . . 24 VAC Output

TB1-C . . . . . Common (GND)

Outdoor Air Quality

The outdoor air quality (OAQ) sensor is a field-installed accessory that measures CO_2 levels in the air. When installing this sensor, an ECB board must be installed and the unit must be configured for OAQ use by setting ***Configuration→AIR.Q→OA.CF*** to a value of 1 or 2. See the Indoor Air Quality section for more information.

TB1-4 . . . . . 4-20 mA Input

TB1-3 . . . . . Sensor Common

TB1-R . . . . . 24 VAC Output

TB1-C . . . . . Common (GND)

Smoke Detectors

The smoke detectors are field-installed accessories. These detectors can detect smoke in either the return air (part no. CRSMKDET003A00) or supply and return air (part no. CRSMKSUP002A00). When installing either detector, the unit must be configured for fire shutdown by setting ***Configuration→UNIT→FS.SW*** to normally open (1) or normally closed (2).

TB1-Fire Shutdown-1 . . . . Dry Contact Source

TB1-Fire Shutdown-2 . . . . Discrete Input to Board

TB1-R . . . . . 24 VAC Output

TB1-C . . . . . Common (GND)

Filter Status

The filter status accessory (part no. CRSTATUS002B00) is a field-installed accessory. This accessory detects plugged filters. When installing this accessory, the unit must be configured for filter status by setting ***Configuration→UNIT→FL.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration. Filter status wires are pre-run in the unit harness and located near the switch installation location. Refer to the Filter Accessory Installation Instructions for more information.

Fan Status

The fan status accessory (part no. CRSTATUS003B00) is a field-installed accessory. This accessory detects when the indoor fan is blowing air. When installing this accessory, the unit must be configured for fan status by setting ***Configuration→UNIT→FN.SW*** to normally open (1) or normally closed (2). Normally open (1) is the preferred configuration. Fan status wires are pre-run in the unit harness and located near the switch installation location. Refer to the Fan Accessory Installation Instructions for more information.

IMPORTANT: The Fan Status terminals on TB1 are NOT to be used.

Enthalpy Sensors

The enthalpy accessories (part no. CRENTSNG002A00 and CRENTDIF002A00) are field-installed accessories. The first accessory (outdoor air only) determines when the enthalpy is low relative to a fixed reference. Adding the second accessory (return air) compares the enthalpy between the outdoor and return airstreams. In each case, the enthalpy 4 to 20 mA signals are converted to a switch output which is read by the ECB. When installing this accessory, the unit must be configured for enthalpy-based control by setting ***Configuration→ECON→EN.SW*** to normally open (1). Normal status is an active switch which tells the control that enthalpy is LOW. The actual switch terminal LOW is normally closed. Refer to the Enthalpy Kit Installation Instructions for more information on its installation.

Return/Supply Air Temperature Sensor

The temperature sensor (part no. 33ZCSENSAT) is a field-installed accessory which may be installed on the common return air duct and/or the common supply air duct near the unit. The duct supply air temperature (SAT) may be used to replace the SAT sensor that is internal to the unit. A supply duct SAT measurement is valid for heating mode display while the factory-standard internal SAT is not valid for heating due to its location upstream of the heating section. When installing the supply duct SAT, the unit must be configured by setting ***Configuration→UNIT→SAT.H*** to ENBL. A SAT sensor in the supply duct is the preferred configuration for systems with Carrier variable volume and temperature (VVT®) accessory controls.

Space Humidistat

The Space Humidistat (part no. --HL--38MG-029) is a wall mounted device with an adjustable setpoint to control humidity levels. The humidistat input is provided on the field connection terminal board. The Space Humidity Switch configuration, ***Configuration→UNIT→RH.SW***, identifies the normally open or normally closed status of this input at LOW humidity.

TB1-R . . . . . 24 VAC Dry Contact Source

TB1-W2 . . . . . Discrete Input to Board

Space Humidity Sensor

The space relative humidity sensor (part no. 33ZCSENDRH-01 duct mount or 33ZCSENSRH-01 wall mount) is a field-installed accessory. The space relative humidity (RHS) may be selected for use if the outdoor air quality sensor (OAQ) is not used and an economizer board is installed. When installing the relative humidity sensor, the unit must be configured by setting ***Configuration→UNIT→RH.S*** to YES.

TB1-1 . . . . . 24 VDC Loop Power

TB1-4 . . . . . 4-20 mA Input Signal

SERVICE

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lockout tag. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Puron® (R-410A) refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron refrigerant equipment.

⚠ WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in personal injury, death and/or property damage.

1. Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Refer to the User's Information Manual provided with this unit for more details.
2. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

What to do if you smell gas:

1. DO NOT try to light any appliance.
2. DO NOT touch any electrical switch, or use any phone in your building.
3. IMMEDIATELY call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
4. If you cannot reach your gas supplier, call the fire department.

⚠ WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in personal injury or death.

Disconnect gas piping from unit when pressure testing at pressure greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by closing the manual gas valve(s).

Cleaning

Inspect unit interior at beginning of each heating and cooling season and as operating conditions require. Remove unit top panel and/or side panels for access to unit interior.

Coil Maintenance and Cleaning Recommendation

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

Remove Surface Loaded Fibers

Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage to the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse

A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

Routine Cleaning of Round-Tube Coil Surfaces

Monthly cleaning with Totaline® environmentally sound coil cleaner is essential to extend the life of coils. This cleaner is available from Carrier Replacement parts division as part number P902-0301 for a one gallon container, and part number P902-0305 for a 5 gallon container. It is recommended that all round-tube coils, including standard aluminum, pre-coated, copper/copper or E-coated coils be cleaned with the Totaline environmentally sound coil cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline environmentally sound coil cleaner is non-flammable, hypoallergenic, non-bacterial, and a USDA accepted biodegradable agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces, or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

Totaline Environmentally Sound Coil Cleaner Application Equipment

- $2^1/_2$ gallon garden sprayer
- water rinse with low velocity spray nozzle

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in corrosion and damage to the unit.

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean outdoor or indoor coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Totaline environmentally sound coil cleaner as described above.

⚠ CAUTION

UNIT RELIABILITY HAZARD

Failure to follow this caution may result in reduced unit performance.

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop.

Totaline Environmentally Sound Coil Cleaner Application Instructions

1. Proper eye protection such as safety glasses is recommended during mixing and application.
2. Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
3. Thoroughly wet finned surfaces with clean water and a low velocity garden hose, being careful not to bend fins.
4. Mix Totaline environmentally sound coil cleaner in a $2^1/_2$ gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100°F.

IMPORTANT: Do NOT use water in excess of 130°F, as the enzymatic activity will be destroyed.

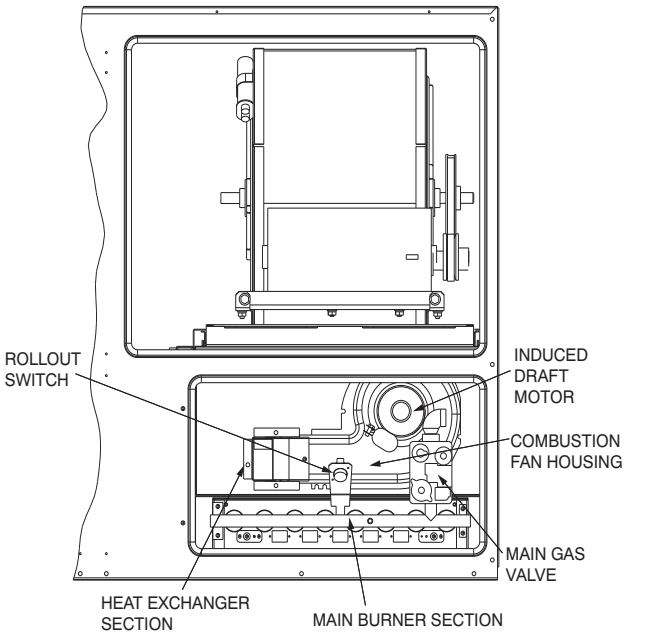
5. Thoroughly apply Totaline® environmentally sound coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
6. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
7. Ensure cleaner thoroughly penetrates deep into finned areas.
8. Interior and exterior finned areas must be thoroughly cleaned.
9. Finned surfaces should remain wet with cleaning solution for 10 minutes.
10. Ensure surfaces are not allowed to dry before rinsing. Reapplying cleaner as needed to ensure 10-minute saturation is achieved.
11. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

Condensate Drain Pan

Check and clean each year at the start of the cooling season. In winter, keep drains and traps dry.

To clean the condensate pan:

1. Disconnect condensate drain system from side or bottom drain connection.
2. Remove and clean trap.
3. Remove 4 screws securing condensate pan access cover to unit. Save screws and panel.
4. Slide condensate pan out from unit and clean. Pan is made of non-corrosive plastic. Use a mild cleaner to remove heavy deposits of dirt and grime.
5. Replace pan in unit.
6. Replace condensate pan access cover with 4 screws saved from Step 3.
7. Re-attach and prime condensate trap.
8. Connect condensate drainage system.



C07037

Fig. 29 - Typical Gas Heating Section

Filters

Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to unit Installation Instructions for type and size.

Outdoor-Air Inlet Screens

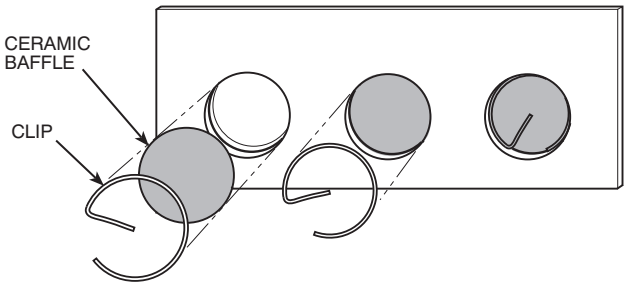
Clean screens with steam or hot water and a mild detergent. Do not use throwaway filters in place of screens. See unit installation instructions for quantity and size.

Main Burner (48PD)

At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames. Refer to Main Burners section.

Flue Gas Passageways (48PD)

The flue collector box and heat exchanger cells may be inspected by opening heat section access door, flue box cover, and main burner assembly. (See Fig. 29.) Refer to Main Burners section for burner removal sequence. If cleaning is required, clean tubes with a wire brush. Use Caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. (See Fig. 30.)



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

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Fig. 30 - Removing Heat Exchanger Ceramic Baffles and Clips

Combustion-Air Blower (48PD)

Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To inspect blower wheel, open heat section door. Using a flashlight, look into the flue exhaust duct to inspect. If cleaning is required, remove motor and wheel assembly by removing the screws holding the flue box cover to the flue box. Remove the screws holding the inducer housing to the inlet plate. The wheel can then be removed from the motor shaft and cleaned with a detergent or solvent. Replace the wheel onto the motor shaft in the correct position and reassemble the flue cover onto the flue box.

Lubrication

Compressors

Each compressor is charged with the correct amount of oil at the factory.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in damage to unit components.

The compressor is in a Puron refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere.

Polyolester (POE) compressor lubricants are known to cause long term damage to some synthetic roofing materials. Exposure, even if immediately cleaned up, may cause roofing materials to become brittle (leading to cracking) within a year. When performing any service which may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures which risk oil leakage include compressor replacement, repairing refrigerant leaks, and replacing refrigerant components. To prepare rooftop:

1. Cover extended roof work area with an impermeable plastic dropcloth or tarp. Make sure a 10 x 10 ft area around the work area is covered.
2. Cover area in front of the unit service panel with a terry cloth shop towel to absorb lubricant spills and prevent run-offs. Towel will also protect dropcloth from tears caused by tools or components.
3. Place terry cloth shop towel inside the unit directly under components to be serviced to prevent spills through the bottom of the unit.
4. Perform the required service.
5. Remove an dispose of any oil contaminated material per local codes.

Indoor Fan Shaft Bearings

The indoor fan has permanently sealed bearings. No field lubrication is necessary.

Condenser and Evaporator-Fan Motor Bearings

The condenser-fan and evaporator-fan motors have permanently sealed bearings, so no field lubrication is necessary.

Economizer or Manual Outside Air Damper

If blade adjustment is required, refer to unit or accessory installation instructions.

Evaporator Fan Service and Replacement

The units feature a slide-out fan deck for easy servicing of the indoor-fan motor, pulleys, belt, bearings and VFD. To service components in this section, perform the following procedure:

1. Turn off unit power.
2. Open the fan section access door.
3. Remove two no. 10 screws at front of slide-out fan deck. Save screws. (See Fig. 31.)
4. Disconnect the electrical wires connected to the slide-out fan deck (supply air thermistor and fan status switch if installed). Wires may be damaged if not disconnected.
5. Fan deck can now be slid out to access serviceable components.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in damage to the unit.

DO NOT SLIDE FAN DECK OUT PAST THE FAN DECK STOP. If further access is required, the fan deck must be supported. Make sure plugs and wiring are not pinched between fan housing and unit sheet metal post.

6. To replace fan deck to operating position, slide fan deck back into the unit. Secure with the two no. 10 screws removed in Step 3.
7. Re-attach electrical wires.
8. Close fan section access door.
9. Restore power to unit.

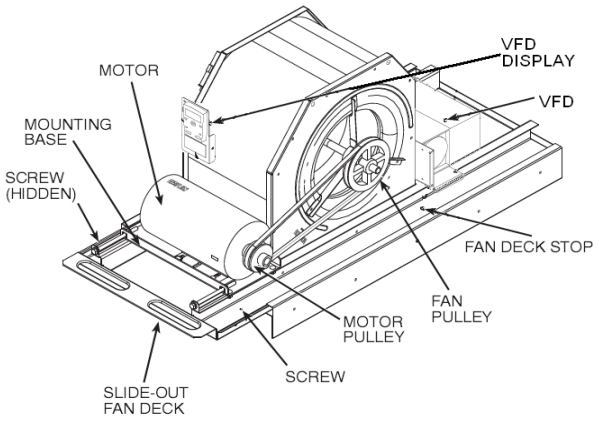

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Fig. 31 - Evaporator-Fan Motor Adjustment

Evaporator Fan Performance Adjustment

Fan motor pulleys are factory set for speed shown in Appendix D.

To change fan speeds:

1. Shut off unit power supply.
2. Loosen nuts on the 4 carriage bolts in the mounting base. Using adjusting bolts and plate, slide motor and remove belt.
3. Loosen movable-pulley flange setscrew. (See Fig. 32.)
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Appendix D.
   See Appendix D for air quantity limits.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Appendix D for speed change for each full turn of pulley flange.)
6. Replace belts.

7. Realign fan and motor pulleys:
   a. Loosen fan pulley setscrews.
   b. Slide fan pulley along fan shaft.
   c. Make angular alignment by loosening motor from mounting plate.
8. Tighten belts.
9. Restore power to unit.

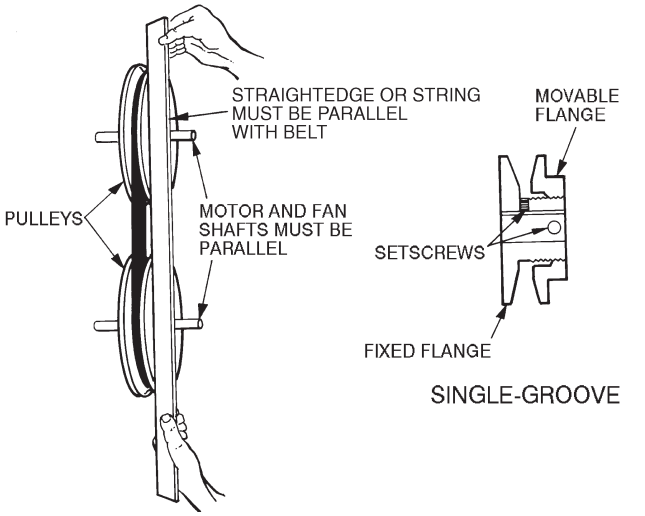

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Fig. 32 - Evaporator-Fan Alignment and Adjustment

Evaporator Fan Belt Tension Adjustment

To adjust belt tension:

1. Turn off unit power.
2. Slide out fan deck to service position as shown in Evaporator Fan Service and Replacement section above.
3. Loosen motor mounting plate bolts.
4. Move motor mounting plate to adjust to proper belt tension. Motor adjuster bolts may be used to tighten belts. (See Fig. 31.) Do not overtighten belt.
5. Check for proper belt alignment. Adjust if necessary.
6. Tighten motor mounting plate bolts to lock motor in proper position.
7. Return fan deck back into operating position.
8. Restore power to unit.

Variable Frequency Drive (VFD) Replacement

The 48/50PD units are equipped with a VFD that is mounted behind the blower housing on the fan sled. The VFD's remote display is mounted on the front of the fan housing for easier access. The VFD is mounted to a plate which is mounted to the fan sled. When accessing the VFD or to remove the VFD, follow the Evaporator fan service and replacement Steps 1-5 and the following steps:

IMPORTANT: If fan deck stop screws are removed for further access, the front of the fan deck MUST BE SUPPORTED.

1. Remove the 2 screws holding the VFD's mount bracket to the fan sled. The horizontal cross section of the bottom half of the mount bracket is shown on Fig. 33.
2. Cut the wire ties holding the VFD power wires to the fan housing and the two wire ties holding the control wires to the VFD display/keypad at the top of the fan scroll.
3. With the VFD still attached, remove the mount bracket from the fan sled. To do this requires a slight lift on the screw side then a push towards the pulley side of the fan sled. (See Fig. 33.) Lift out the bracket when the pulley side is clear from the fan sled.
4. With all the wires stilled attached to the VFD, turn the VFD assembly so it is parallel with the fan sled.
5. Pull the VFD assembly to the front of the fan sled and place in a secure flat surface.
6. Disconnect the power, ground, RJ45, and control wiring to the VFD making sure to note their connections.

IMPORTANT: Wires are marked with VFD terminal labels and wiring diagram shows the wiring connections.

7. Remove the 4 screws holding the VFD to the mount bracket and remove the VFD.
8. Remove the replacement VFD cover and install jumper wires provided with it as shown on the unit wiring diagram. If jumpers are not provided with the replacement VFD, remove them from the defective one or field supply the jumpers.
9. Set AI1 and AI2 DIP switches to the U (off) direction as indicated on the plastic housing near the DIP switch.
10. Replace the VFD with the new one.
11. Install the 4 screws in the VFD to secure it to the mounting bracket.
12. Connect the wiring as it was on the previous VFD, refer to the wiring diagram.
13. Move the VFD assembly to the back of the fan sled.
14. Turn the VFD assembly lengthwise with the fan housing, making sure the screw side of the bracket lines up with the screw holes on the fan sled.
15. Make sure the bracket s pulley side U bend is clear of the fan sled and pull the assembly towards the screw side.
16. Install the 2 screws in the bracket to secure it to the fan sled.
17. Secure power and control wires with new wire ties.
18. Follow the Evaporator fan service and replacement Steps 6-9.
19. Power up VFD and set up its parameters per Table 40 in Appendix B.

IMPORTANT: If fan deck stops were removed, they must be reinstalled.

For VFD service and maintenance, refer to Appendix B.

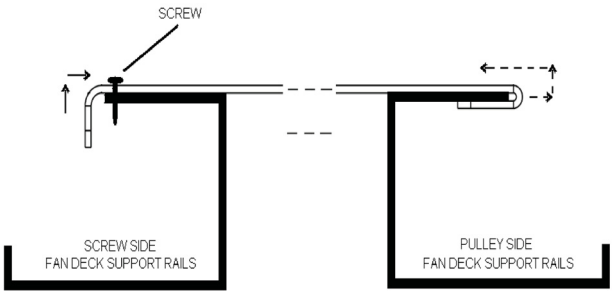

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Fig. 33 - VFD Mount Bracket Cross Section

Condenser-Fan Adjustment

1. Shut off unit power supply.
2. Remove condenser-fan assembly (grille, motor, motor cover, and fan) and loosen fan hub setscrews.
3. Adjust fan height as shown in Fig. 34.
4. Tighten setscrews and replace condenser-fan assembly.
5. Turn on power to unit.

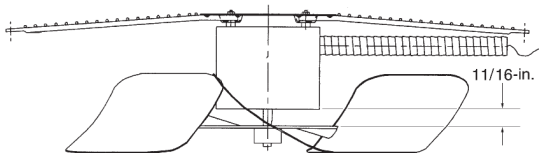

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Fig. 34 - Condenser-Fan Adjustment

Verify Sensor Performance

Verify that thermistor, transducer, and switch inputs are reading correctly. These values can be accessed through the Scrolling Marquee display in the Temperatures, Pressures, and Inputs menus. Some values will depend on configuration choices. Refer to the Control Set Up Checklist completed for the specific unit installation and to the configuration tables in Appendix A.

Economizer Operation During Power Failure

Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored. *Do not manually operate damper motor.*

Evacuation

Proper evacuation of the system will remove noncondensables and ensure a tight, dry system before charging. Evacuate from both high and low side ports. Never use the system compressor as a vacuum pump. Refrigerant tubes and indoor coil should be evacuated to 500 microns. Always break a vacuum with dry nitrogen. The two possible methods are the deep vacuum method and the triple evacuation method.

Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a minimum vacuum of 500 microns and a vacuum gauge capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water. (See Fig. 35.)

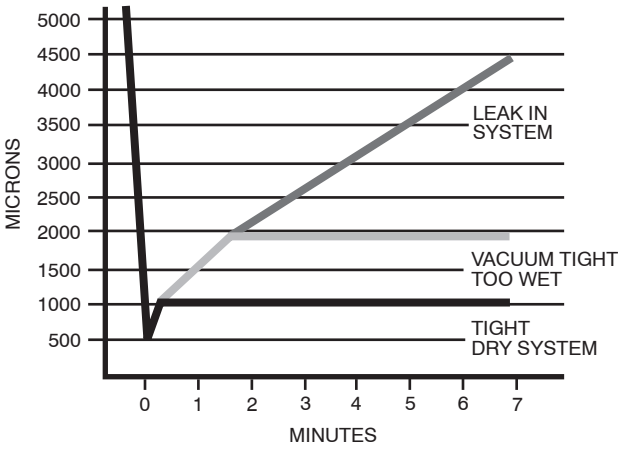

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Fig. 35 - Deep Vacuum Graph

Triple Evacuation Method

The triple evacuation method should only be used when vacuum pump is capable of pumping down to 28-in. of mercury and system does not contain any liquid water. Proceed as follows:

1. Pump system down to 28-in. of mercury and allow pump to continue operating for an additional 15 minutes.
2. Close service valves and shut off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and open until system pressure is 2 psig.
4. Close service valve and allow system to stand for 1 hr. During this time, dry nitrogen will be able to diffuse throughout the system, absorbing moisture.
5. Repeat this procedure. System will then contain minimal amounts of contaminants and water vapor.

Refrigerant Charge

Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures. Unit panels must be in place when unit is operating during charging procedure.

Puron® (R-410A) refrigerant systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Puron (R-410A) refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron refrigerant equipment. Gauge set, hoses, and recovery system must be designed to handle Puron refrigerant. If unsure about equipment, consult the equipment manufacturer.

IMPORTANT: Do not use recycled refrigerant as it may contain contaminants.

No Charge in the System

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to unit nameplate). Verify charge using the charging chart via "Charge in the System."

Charge in the System

IMPORTANT: The circuit must be running in normal cooling mode with the compressor capacity at 100%. The VFD must be running at max fan speed and indoor airflow must be within specified air quantity limits for cooling (See Appendix D). All outdoor fans must be on and running at high speed. Use the Cooling Service Test Outdoor Fan Override function to start all outdoor fans.

An accurate pressure gauge and temperature-sensing device is required. Charging is accomplished by ensuring the proper amount of liquid subcooling. Connect pressure gauge to the compressor discharge service valve. Connect temperature sensing device to the liquid line between the condenser and the TXV (thermostatic expansion valve), and insulate it so that ambient temperature does not affect reading. Use the cooling charging chart (Fig. 36-37) to determine if additional charge is needed or if some charge needs to be removed from the system.

To Use the Cooling Charging Chart

Use the temperature and pressure readings, and find the intersection point on the cooling charging chart. If intersection point on chart is above line, add refrigerant. If intersection point on chart is below line, carefully recover some of the charge. Recheck suction pressure as charge is adjusted.

The TXV is set to maintain between 10 and 15 degrees of superheat at the compressors. The valves are factory set and cannot be adjusted. Do not use A TXV designed for use with R-22.

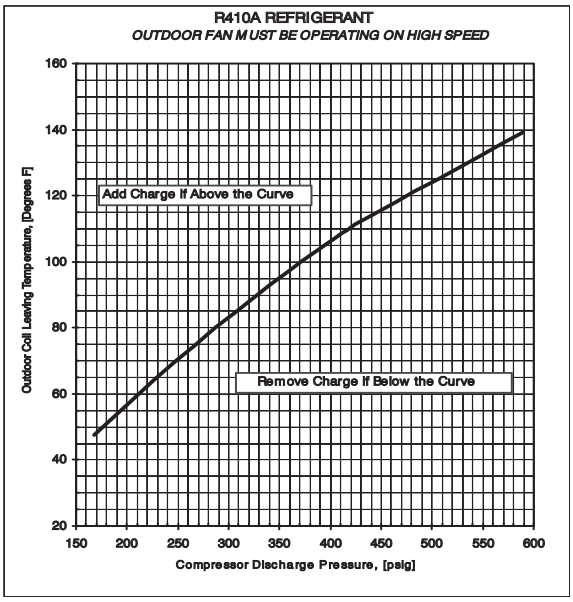

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Fig. 36 - Charging Chart — 48/50PD05

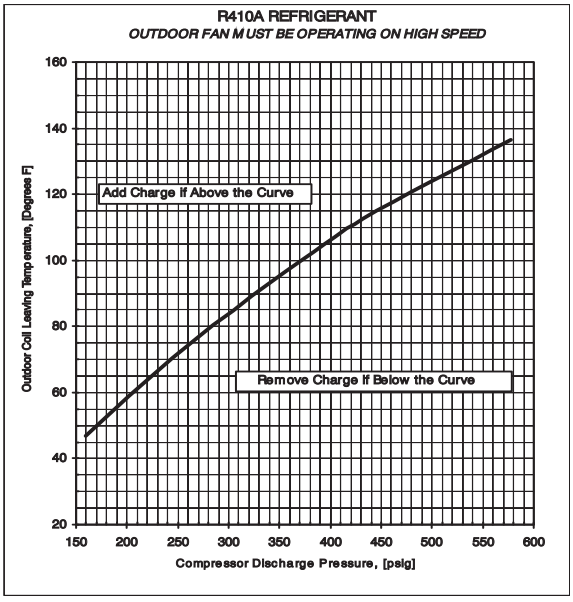

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Fig. 37 - Charging Chart — 48/50PD06

Puron® Refrigerant

Puron refrigerant operates at 50 to 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron refrigerant. Do not mix with components that have been used with other refrigerants. Puron refrigerant, as with other HFCs, is only compatible with POE oils.

Recovery cylinder service pressure rating must be 400 psig. Puron systems should be charged with liquid refrigerant. Use a commercial-type metering device in the manifold hose. Manifold sets should be 750 psig high-side and 200 psig low-side with 520 psig low-side retard. Use hoses with 750 psig service pressure rating. Leak detectors should be designed to detect HFC refrigerant.

Table 26 – Altitude Compensation*

48PG03-07

ELEVATION (ft)	NATURAL GAS ORIFICE†	PROPANE ORIFICE†
0-1,999	45	52
2,000	47	52
3,000	47	53
4,000	47	53
5,000	48	53
6,000	48	53
7,000	48	53
8,000	49	54
9,000	49	54
10,000	50	54
11,000	51	54
12,000	51	55
13,000	52	55
14,000	52	56

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes. Includes a 4% input reduction per each 1000 ft.

† Orifices available through your Carrier dealer.

Gas Valve Adjustment (48PD Units Only)

The gas valve opens and closes in response to the thermostat or limit control.

When power is supplied to valve terminals W2 (High Fire) and C1, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body.

To adjust regulator:

1. Set unit at setting for no call for heat.
2. Turn main gas valve to OFF position.
3. Remove $^1/_8$-in. pipe plug from manifold pressure tap connection. Install a suitable pressure-measuring device.
4. Set main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw. (See Fig. 38.)
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure. The setting is 3.50 in. wg on sizes 03-14 and 3.00 on size 16-28.

8. Once desired pressure is established, set unit setting for no call for heat, turn off main gas valve, remove pressure-measuring device, and replace $^1/_8$-in. pipe plug and screw cap.

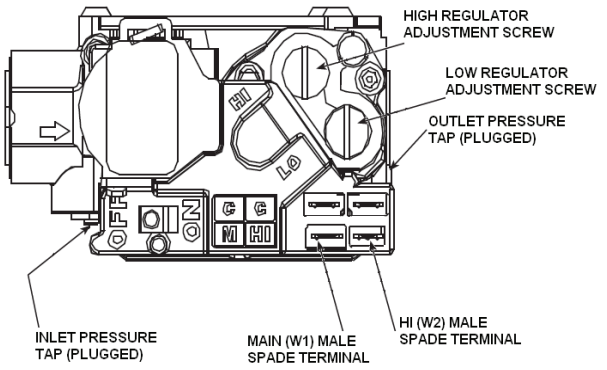

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Fig. 38 – 48PD Gas Valve

High Altitude (48PD Units Only)

For high altitude applications greater than 2,000 ft the heat input rate should be reduced. The higher the altitude is above sea level, the less oxygen is in the air. See Table 7 for orifice sizing. A high altitude kit is available to convert unit for altitudes up to 7,000 ft.

Main Burners (48PD Units Only)

For all applications, main burners are factory set and should require no adjustment.

Main Burner Removal

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Open gas section access door.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and ignitor cable from IGC board.
8. Remove 2 screws that hold the burner assembly to vestibule plate.
9. Rotate the burner/manifold assembly to the right, away from the flue extension and lift burner/manifold assembly out of unit.

Cleaning and Adjustment

1. Remove burner rack from unit as described in Main Burner Removal section above.
2. Inspect burners, and if dirty, remove burners from rack. The two outer burners have the flame crossover closed off in order to prevent gas flow from exiting the sides of the burner assembly. To prevent ignition problems, make sure the outer burners are returned to their original position when done servicing.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. (See Fig. 39.)
5. Reinstall burners on rack.
6. Reinstall burner rack as described above.

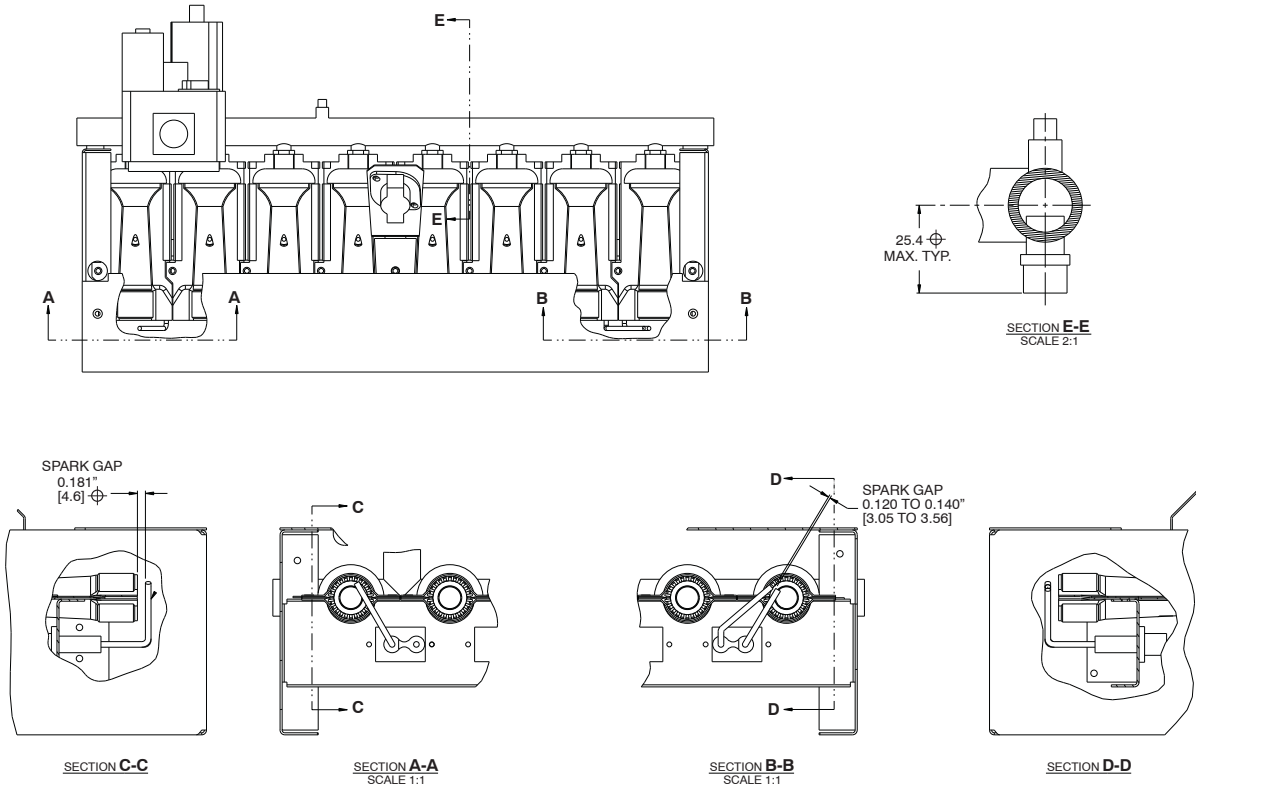

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Fig. 39 – Spark Gap Adjustment

Filter Drier

Replace filter drier whenever refrigerant system is exposed to atmosphere. Only use factory specified liquid-line filter driers with working pressures no less than 650 psig. Do not install a suction-line filter drier in liquid line. A liquid-line filter drier designed for use with Puron® refrigerant is required on every unit.

Protective Devices

Compressor Rotation

Overcurrent

Each compressor has internal line break motor protection.

Overtemperature

Each compressor has an internal protector to protect it against excessively high discharge gas temperatures.

High-Pressure Switch

If the high-pressure switch trips, the compressor will shut down and the current sensor (3-phase units only) will not detect current. See the Current Sensor section below for more information.

Current Sensor (CS) (3-Phase Units Only)

The purpose of the CS is to detect losses in compressor power. After detecting a loss in compressor power, unit control locks out the compressor for 15 minutes. After 15 minutes, the alarm will automatically reset. If this alarm occurs 3 times consecutively, the compressor will remain locked out until an alarm reset is initiated via CCN or manually via the Scrolling Marquee display (see Alarms and Alerts section for more details).

IMPORTANT: The current sensor is not currently used in the 48/50PD, but reserved for future implementation.

Evaporator Fan Motor Protection

Indoor-fan motors less than 5 hp are equipped with internal overcurrent and overtemperature protection. Protection devices reset automatically. Disconnect and lock out power when servicing motor. Indoor-fan motors 5 hp and larger are equipped with a manual reset, calibrated trip, magnetic circuit breaker and overcurrent protection. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Condenser-Fan Motor Protection

Each condenser-fan motor is internally protected against overtemperature.

Fuses are located in the control box and feed power to the condenser fan motors. Always replace blown fuses with the correct size fuse as indicated on the unit fuse label.

Saturated Suction Pressure (SSP)

If the SSP for a particular circuit is reading below the alarm set point for an extended period of time, that circuit will be shut down. After 15 minutes, the alarm will automatically reset. If this alarm occurs 3 times consecutively, the circuit will remain locked out until an alarm reset is initiated via CCN or manually via the Scrolling Marquee display (see Alarms and Alerts section for more details).

Relief Devices

All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side and are located at the suction line service port. Protect joint during brazing operations near joint.

Compressor Sound Shield

The 48/50PD units are equipped with a compressor sound shield. The sound shield has two parts, the compressor jacket encloses the shell of the compressor and the base shield is installed between the bottom of the compressor and the unit base pan. The sound shield reduces the difference in noise levels as the compressor loads and unloads in the frequency ranges of 200 to 2000 Hz. Since the human speech occurs in the 200 to 2000 Hz frequency ranges the sound shield reduces the speech annoyance caused by the loading and unloading of the compressor.

The compressor jacket is held closed around the compressor by Velcro tape. To remove the compressor jacket, separate the Velcro along the side and top of the compressor. Slide the jacket toward the back of the compressor to remove the jacket. Make sure the jacket is reinstalled after servicing or replacing the compressor.

The compressor base shield is accessible when the compressor is removed. To remove the base shield without removing the compressor, remove one front compressor mounting bolt and grommet. At the three remaining compressor mounting grommets, cut the sound shield so that the base shield can be slid in the direction of the compressor mounting bolt and grommet that was removed. (See Fig. 40.) Cut replacement base shield along dotted lines as shown in Fig. 40 and reinstall in reverse direction. When installing the base shield, place the soft side facing upward. Reinstall compressor mounting grommet and bolt.

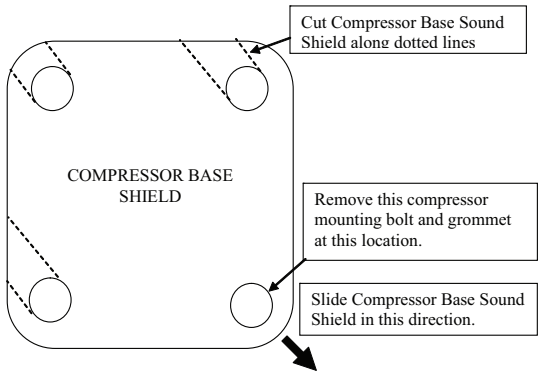

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Fig. 40 - Base Sound Shield

Control Circuit, 24-V

Each control circuit is protected against overcurrent by a 3.2 amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

Replacement Parts

A complete list of replacement parts may be obtained from any Carrier distributor upon request.

Diagnostic LEDs

The MBB, ECB, AUX1, IGC and DSC control boards have LED lights for diagnostic purposes. The meanings and error codes can be found in the the troubleshooting section of this manual.

APPENDIX A - LOCAL DISPLAY AND CCN TABLES

Table 27 – MODE - RUN STATUS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS
RUN STATUS				STATUS DISPLAY		
VIEW	Auto View of Run Status			(VIEW = Display only)		
HVAC	HVAC Mode Status	1=Disabled 2=Fan Only 3=Cool 4=Heat			HVACMODE	
OCC	Currently Occupied	Yes/No			OCCUPIED	
SAT	Supply Air Temperature	xxx..x	dF		SAT_DISP	
ALRM	Current Alarms & Alerts	xx			ALRMALRT	
TIME	Time of Day	xx.xx	hh.mm		TIMECOPY	
VERS	Software Version Numbers			VERSIONS		
MBB	CESR131459–xx–xx	(xx–xx in table)			MODEL_NUMBER_01	
ECB	CESR131249–xx–xx				MODEL_NUMBER_02	
AUX	CESR131333–xx–xx				MODEL_NUMBER_03	
MARQ	CESR131171–xx–xx				MODEL_NUMBER_04	
MODE	Control Modes			MODEDISP		
SYS	Unit operation disabled Unit operation enabled Service test enabled	1 of 3 texts will be displayed			SYS_MODE_TEXT1 SYS_MODE_TEXT2 (table only) SYS_MODE_TEXT3 (table only)	
HVAC	HVAC Operation Disabled Ventilation (fan–only) Cooling Unoccupied Free Cooling Heating	1 of 5 texts will be displayed			HVACMODE_TEXT_1 HVACMODE_TEXT_2 (table only) HVACMODE_TEXT_3 (table only)	
HV.DN	Remote HVAC Mode Disable	Yes/No			HVACDOWN	forcible
EFF.C	Cool Setpoint in Effect	xxx.x			CSP_EFF	
EFF.H	Heat Setpoint in Effect	xxx.x			HSP_EFF	
OCC	Currently Occupied	Yes/No			OCCUPIED	forcible
T.OVR	Timed Override in Effect	Yes/No			MODETOVR	
LINK	Linkage Active	Yes/No			MODELINK	
D.LMT	Demand Limit In Effect	Yes/No			MODEDMDL	
C.LOC	Compressor OAT Lockout	Yes/No			COMPLOCK	
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK	
OK.EC	OK to Use Economizer?	Yes/No			ECONCOOL	
COOL	Cooling Status			COOLDISP		
DMD.C	Cooling Demand	xxx.x	^F		COOL_DMD	
SA.CP	Supply Air Control Point	xxx.x	dF		SA_CTLPT	
SASP	Cool Supply Air Setpoint	xxx.x	dF		SASP	
SR.CD	Cool Demand SASP Reset	xxx.x	^F		CD_RESET	
SR.RH	Dehumidifying SASP Reset	xxx.x	^F		RH_RESET	
F.SPD	Commanded Fan Speed	xxx	%		FANSPEED	
CMP.A	Compressor A Feedback	On/Off			COMP_A	
TG.A	Compressor A Timeguard	xxx	sec		TIMGD_A	
CAPC	Compressor Capacity	xxx	%		CAPACITY	
MAX.C	Max Compressor Capacity	xxx	%		MAX_CAPC	forcible
MIN.C	Min Compressor Capacity	xxx	%		MIN_CAPC	
LMT.C	Max Capacity In Effect	xxx	%		CAPLIMIT	
SST.A	Sat. Suction Temp A	xxx.x	dF		SST_A	
SSP.A	Suction Pressure A	xxx.x	psig		SSP_A	
SCT.A	Sat. Condenser Temp A	xxx.x	dF		SCT_A	
SCP.A	Condenser Pressure A	xxx.x	psig		SCP_A	
OFC.1	Outdoor Fan 1 Relay	On/Off			OFC_1	
HEAT	Heating Status			HEATDISP		
DMD.H	Heating Demand	xxx.x	^F		HEAT_DMD	
AVL.H	Available Heating Stages	x			AVLHSTGS	
REQ.H	Requested Heating Stages	x			REQHSTGS	
MAX.H	Max Allowed Heat Stages	x			MAXHSTGS	forcible
LMT.H	Max Heat Stage In Effect	x			HSTGLIMT	
F.SPD	Commanded Fan Speed	xxx	%		FANSPEED	
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1	
TG.H1	Heat Stage 1 Timeguard	xxx	sec		TIMGD_H1	
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2	
TG.H2	Heat Stage 2 Timeguard	xxx	sec		TIMGD_H2	
ECON	Economizer Status			ECONDISP		
EC.CP	Econo Commanded Position	xxx	%		ECONOCMD	
EC.AP	Econo Actual Position	xxx	%		ECONOPOS	
EC.MP	Min Position in Effect	xxx	%		MIN_POS	
IAQ.S	IAQ Level (switch)	High/Low			IAQIN	
IAQ	IAQ Level (sensor)	xxxx	ppm		IAQ	
OAT	Outdoor Air Temperature	xxx.x	dF		OA_TEMP	
RAT	Return Air Temperature	xxx.x	dF		RETURN_T	
ENTH	Outdoor Enthalpy Switch	High/Low			ENTHALPY	
OAQ	OAQ Level (sensor)	xxxx	ppm		OAQ	
PE.1	Power Exhaust 1 Relay	On/Off			PE_1	
PE.2	Power Exhaust 2 Relay	On/Off			PE_2	
HRS	Component Run Hours			STRTHOUR		
A1	Compressor A1 Run Hours	xxxxx.xx	hours		HR_A1	forcible
CCH	Crankcase Htr Run Hours	xxxxx.xx	hours		HR_CCH	forcible
IDF	Indoor Fan Run Hours	xxxxx.xx	hours		HR_IDF	forcible
OFC.1	Outdoor Fan 1 Run Hours	xxxxx.xx	hours		HR_OFC_1	forcible
HT.1	Heat Stage 1 Run Hours	xxxxx.xx	hours		HR_HTR_1	forcible
HT.2	Heat Stage 2 Run Hours	xxxxx.xx	hours		HR_HTR_2	forcible
PE.1	Power Exhaust1 Run Hours	xxxxx.xx	hours		HR_PE_1	forcible
PE.2	Power Exhaust2 Run Hours	xxxxx.xx	hours		HR_PE_2	forcible
ALRM	Alarm Relay Run Hours	xxxxx.xx	hours		HR_ALM	forcible

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 27 — MODE - RUN STATUS (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB−TABLE	CCN POINT	CCN WRITE STATUS
STRT	Component Starts					
A1	Compressor A1 Starts	xxxxxx			ST_A1	forcible
CCH	Crankcase Heater Starts	xxxxxx			ST_CCH	forcible
IDF	Indoor Fan Starts	xxxxxx			ST_IDF	forcible
OFC.1	Outdoor Fan 1 Starts	xxxxxx			ST_OFC_1	forcible
HT.1	Heat Stage 1 Starts	xxxxxx			ST_HTR_1	forcible
HT.2	Heat Stage 2 Starts	xxxxxx			ST_HTR_2	forcible
PE.1	Power Exhaust 1 Starts	xxxxxx			ST_PE_1	forcible
PE.2	Power Exhaust 2 Starts	xxxxxx			ST_PE_2	forcible
ALRM	Alarm Relay Starts	xxxxxx			ST_ALM	forcible
(ALRMDISP) = CCN only)				ALRMDISP		
	Active Alarm 1 Code	xxx			ALMCODE1	
	Active Alarm 2 Code	xxx			ALMCODE2	
	Active Alarm 3 Code	xxx			ALMCODE3	
	Active Alarm 4 Code	xxx			ALMCODE4	
	Active Alarm 5 Code	xxx			ALMCODE5	
	Reset All Current Alarms	Yes/No			ALRESET	forcible
	Reset Alarm History	Yes/No			ALHISCLR	forcible
(GENERIC = CCN only)				GENERIC	up to 20 points	
(LON_DATA = CCN only)				LON_DATA		
	nviSpaceTemp	xxx.x	dF		NVI_SPT	forcible
	nviSetPoint	xxx.x	dF		NVI_SP	forcible
	nvoSpaceTemp	xxx.x	dF		NVO_SPT	
	nvoUnitStatus.mode	xxxx			NVO_MODE	
	nvoUnitStatus.heat_out_p	xxx.x	%		NVO_HPRI	
	nvoUnitStatus.heat_out_s	xxx.x	%		NVO_HSEC	
	nvoUnitStatus.cool_out	xxx.x	%		NVO_COOL	
	nvoUnitStatus.econ_out	xxx.x	%		NVO_ECON	
	nvoUnitStatus.fan_out	xxx	%		NVO_FAN	
	nvoUnitStatus.in_alarm	xxx			NVO_ALRM	
	nviSetPtOffset	xxx.x	^F		NVI_SPTO	forcible
	nviOutsideTemp	xxx.x	dF		NVI_OAT	forcible
	nviOutsideRH	xxxx.x	%		NVI_OARH	forcible
	nvoEffectSetPt	xxx.x	dF		NVO_EFSP	
	nvoOutsideTemp	xxxx.x	dF		NVO_OAT	
	nvoOutsideRH	xxx.x	%		NVO_OARH	
	nviSpaceRH	xxx.x	%		NVI_SPRH	forcible
	nviCO2	xxxxx			NVI_CO2	forcible
	nvoCO2	xxxxx			NVO_CO2	
	nvoTEMP1	xxx.x	dF		NVO_SAT	
	nvoTEMP2	xxx.x	dF		NVO_RAT	
	nviPCT1	xxx.x	%		NVI_RHSP	forcible
	nvoPCT1	xxx.x	%		NVO_SPRH	
	nviDISCRETE1	Off/On			NVI_FSD	forcible
	nviDISCRETE2	No/Yes			NVI_OCC	forcible
	nviDISCRETE3	Off/On			NVI_IAQD	forcible
	nvoDISCRETE1	Off/On			NVO_FSD	
	nvoDISCRETE2	No/Yes			NVO_OCC	
	nvoDISCRETE3	Off/On			NVO_IAQD	
	nciCO2Limit	xxxxx			NCI_CO2	forcible
	nciSetPnts.occupied_cool	xxx.x	dF		NCI_OCSP	forcible
	nciSetPnts.standby_cool	xxx.x	dF		NCI_SCSP	forcible
	nciSetPnts.unoccupd_cool	xxx.x	dF		NCI_UCSP	forcible
	nciSetPnts.occupied_heat	xxx.x	dF		NCI_OHSP	forcible
	nciSetPnts.standby_heat	xxx.x	dF		NCI_SHSP	forcible
	nciSetPnts.unoccupd_heat	xxx.x	dF		NCI_UHSP	forcible

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 28 – MODE - SERVICE TEST

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
SERVICE TEST					MAINTENANCE DISPLAY			
TEST	Field Service Test Mode	On/Off		Off	(TEST = display only)	MAN_CTRL	forcible	forcible
INDP	Test Independent Outputs				TESTINDP			
ECON	Economizer Position Test	0 to 100	%	0		S_ECONO	forcible	forcible
E.CAL	Calibrate Economizer	On/Off		Off		S_ECOCAL	forcible	forcible
PE.1	Power Exhaust 1 Test	On/Off		Off		S_PE_1	forcible	forcible
PE.2	Power Exhaust 2 Test	On/Off		Off		S_PE_2	forcible	forcible
ALRM	Alarm Relay Test	On/Off		Off		S_ALMOUT	forcible	forcible
CCH	Crankcase Heat Test	On/Off		Off		S_CCH	forcible	forcible
FANS	Test Fans				TESTFANS			
IDF	Supply VFD Power Test	On/Off		Off		S_IDF	forcible	forcible
F.SPD	Indoor Fan Speed Test	0 to 100	%	0		S_VSPEED	forcible	forcible
OFC.1	Outdoor Fan Relay Test	On/Off		Off		S_OFC_1	forcible	forcible
COOL	Test Cooling				TESTCOOL			
CTLR	Dig Scroll Ctrl Pwr Test	On/Off		Off		S_CMPCTL	forcible	forcible
CAPC	Compressor Capacity Test	0 to 100	%	0		S_VCAP	forcible	forcible
F.SPD	Cool Test Fan Speed	0 to 100	%	0		S_VSPDCL	forcible	forcible
HEAT	Test Heating				TESTHEAT			
HT.1	Heat Stage 1 Test	On/Off		Off		S_HEAT_1	forcible	forcible
HT.2	Heat Stage 2 Test	On/Off		Off		S_HEAT_2	forcible	forcible

Table 29 – MODE - TEMPERATURES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
TEMPERATURES				STATUS_DISPLAY UINPUT			
AIR.T	Air Temperatures						
SAT	Supply Air Temperature	xxx.x	dF		SAT_DISP		
OAT	Outdoor Air Temperature	xxx.x	dF		OA_TEMP	forcible	forcible
SPT	Space Temperature	xxx.x	dF		SPACE_T	forcible	forcible
SPTO	Space Temperature Offset	xxx.x	dF		SPTO	forcible	forcible
RAT	Return Air Temperature	xxx.x	dF		RETURN_T	forcible	forcible
REF.T	Refrigerant Temperatures	xxx.x	dF				
SST.A	Sat. Suction Temp A	xxx.x	dF		SST_A		
SCT.A	Sat. Condenser Temp A	xxx.x	dF		SCT_A		

Table 30 – MODE - PRESSURES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS
PRESSURES				STATUS_DISPLAY UINPUT		
SSP.A	Suction Pressure A	xxx.x	psig		SSP_A	
SCP.A	Condenser Pressure A	xxx.x	psig		SCP_A	

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 31 – MODE - SET POINTS

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT
					SETPOINT CONFIGURATION	
SETPOINTS					SET_PNT	
OCSP	Occupied Cool Setpoint	55 to 80F	dF	78		OCSP
UCSP	Unoccupied Cool Setpoint	75 to 95F	dF	85		UCSP
OHSP	Occupied Heat Setpoint	55 to 80F	dF	68		OHSP
UHSP	Unoccupied Heat Setpoint	40 to 80F	dF	60		UHSP
GAP	Heat–Cool Setpoint Gap	2 to 10F	^F	5		HCSP_GAP
STO.R	SPT Offset Range (+/–)	0 to 5F	^F	5		SPTO_RNG
SASP	Cool Supply Air Setpoint	45 to 75	dF	65		SASP
RH.SP	Space RH Setpoint	30 to 95	%	50		SPRH_SP
RH.DB	Space RH Deadband	2 to 20	%	5		SPRH_DB
C.LO	Compressor Lockout Temp	0 to 100F	dF	0		OATLCOMP
HT.LO	Heating Lockout Temp	40 to 125F	dF	75		OATLHEAT
EH.LO	Econo Cool Hi Temp Limit	40 to 100F	dF	65		OATLECLH
EL.LO	Econo Cool Lo Temp Limit	–30 to 50F	dF	0		OATLECLL
FC.LO	Free Cool Low Temp Limit	0 to 70F	dF	50		OATLUEFC

Table 32 – MODE - INPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
				STATUS DISPLAY			
INPUTS				UINPUT			
GEN.I	General Inputs						
FIL.S	Filter Status Switch	Dirty/Clean			FILTSTAT	forcible	
FAN.S	Fan Status Switch	On/Off			FAN_STAT	forcible	
FDWN	Fire Shutdown Switch	On/Off			FIREDOWN	forcible	
ENTH	Outdoor Enthalpy Switch	High/Low			ENTHALPY	forcible	
RM.OC	Remote Occupancy Switch	On/Off			REM_OCC	forcible	
HUM	Space Humidity Switch	High/Low			HUM_STAT	forcible	
CMP.A	Compressor A Feedback	On/Off			COMP_A		
C.ALM	Scroll Compressor Alarm	On/Off			COMP_ALM		
CS.IN	Current Sensor Inputs						
CS.A1	Compressor A1 Feedback	On/Off			CS_A1		
AIR.Q	Air Quality Inputs						
IAQ.S	IAQ Level (switch)	High/Low			IAQIN	forcible	forcible
IAQ	IAQ Level (sensor)	xxxx	ppm		IAQ	forcible	forcible
OAQ	OAQ Level (sensor)	xxxx	ppm		OAQ	forcible	forcible
SP.RH	Space Humidity Sensor	xxx.x	%		SPRH	forcible	forcible

Table 33 – MODE - OUTPUTS

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
				STATUS DISPLAY			
OUTPUTS				UOUTPUT			
FANS	Fan Outputs						
IDF	Indoor Fan VFD Pwr Relay	On/Off			IDF		
F.SPD	Commanded Fan Speed	xxx	%		FANSPEED		
OFC.1	Outdoor Fan 1 Relay	On/Off			OFC_1		
COOL	Cool Outputs						
CTLR	Digital Scroll Ctrl Pwr	On/Off			COMPCTLR		
CAPC	Compressor Capacity	xxx	%		CAPACITY		
CCH	Crankcase Heat Relay	On/Off			CCH		
HEAT	Heat Outputs						
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1		
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2		
ECON	Economizer Outputs						
EC.CP	Econo Commanded Position	0 to 100	%		ECONOCMD	forcible	forcible
EC.AP	Econo Actual Position	0 to 100	%		ECONOPOS		
PE.1	Power Exhaust 1 Relay	On/Off			PE_1	forcible	forcible
PE.2	Power Exhaust 2 Relay	On/Off			PE_2	forcible	forcible
ALRM	Alarm Relay	On/Off			ALMOUT	forcible	forcible

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 34 – MODE - CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT	PAGE NO.
CONFIGURATION					SERVICE CONFIGURATION		
DISP	Display Configuration				DISPLAY		
METR	Metric Display	On/Off		Off		DISPUNIT	13
LANG	Language Selection	0=English 1=Spanish 2=French 3=Portuguese		0		LANGUAGE	13
PROT	Password Enable	Enable/Disable		Disable		PASS_EBL	13
PSWD	Service Password	0000 to 9999		1111		PASSWORD	13
TEST	Test Display LEDs	On/Off		Off	(display only, not in table)	DISPTEST	13
UNIT	Unit Configuration				UNIT		
S.DLY	Startup Delay	0 to 600	sec	30		STARTDLY	13
OC.FN	Fan On When Occupied	Yes/No		Yes		OCC_FAN	13
IDF.F	Shut Down on IDF Failure	Yes/No		Yes		FATALFAN	13
FS.MX	Supply Fan Maximum Speed	80 to 100	%	100		SPEEDMAX	13
FS.MN	Supply Fan Minimum Speed	10 to 70	%	70		SPEEDMIN	13
FS.VM	Vent Mode Fan Speed	10 to 100	%	50		SPEEDVNT	13
FN.SW	Fan Status Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		FANSTCFG	13
FL.SW	Filter Status Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		FILSTCFG	13
FS.SW	Fire Shutdown Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		SHTDNCFG	13
RM.SW	Remote Occupancy Switch	0=No Switch 1=Normal Open 2=Normal Closed		0		REMOCCFG	13
RH.S	RH Sensor on OAQ Input	Yes/No		No		RH_OAQ	14
RH.SW	Space Humidity Switch	0=No Switch 1=Normal Open 2=Normal Closed		0		HUMSTCFG	14
TCS.C	Temp Cmp Strt Cool Factr	0 to 60	mins	0		TCSTCOOL	14
TCS.H	Temp Cmp Strt Heat Factr	0 to 60	mins	0		TCSTHEAT	14
COOL	Cooling Configuration				COOL_CFG		
MIN.C	Min Compressor Capacity	15 to 80	%	70		MIN_CAPC	17
FS.CD	Fan Speed Control Demand	1 to 9.9	^F	3		SPEEDDMD	16
MRT.C	Compressor Min On Time	120 to 999	sec	180		MIN_ON	
MOT.C	Compressor Min Off Time	300 to 999	sec	300		MIN_OFF	
RST.C	Runtime to Reset Strikes	120 to 999	sec	300		MIN_ON_S	25
FOD.C	Fan-off Delay, Mech Cool	0 to 600	sec	60		COOL_FOD	
CS.A1	Current Sensing A1	Enable/Disable		Disable: reserved for future use DO NOT ENABLE		A1_SENSE	26
C.LO	Compressor Lockout Temp	0 to 100F	dF	0		OATLCOMP	
ALM.N	Alert Each Strike	Yes//No		Yes		ALM_NOW	25
SAT	Supply Air Temperature						
SASP	Cool Supply Air Setpoint	45 to 75	dF	65		SASP	16
SA.MU	SASP Maximum Reset Up	0 to 20	^F	10		SASPMAXU	16
SA.MD	SASP Maximum Reset Down	–20 to 0	^F	–10		SASPMAXD	16
SST	Low Suction Control						
SST.O	Suction OK Temperature	10 to 50	dF	18		SSTOK	27
SST.1	Low Suction – Level 1	10 to 50	dF	20		SSTLEV1	27
SST.2	Low Suction – Level 2	5 to 50	dF	15		SSTLEV2	27
SST.3	Low Suction – Level 3	0 to 50	dF	10		SSTLEV3	27
PSI.D	Ckt A Minimum Pressure	0 to 500	psig	20		DELTAP_A	27
OFC	Outdoor Fan Control						
1.MXP	Fan Lev1 Max Pressure	100 to 500	psig	450		LEV1MAXP	18
2.MNP	Fan Lev2 Min Pressure	100 to 500	psig	200		LEV2MINP	18
2.ON	Fan Lev2 On Temperature	0 to 100	F	55		LEV2ON	18
2.OFF	Fan Lev2 Off Temperature	0 to 100	F	45		LEV2OFF	18

Table 34 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT	PAGE NO.
HEAT	Heating Configuration				HEAT_CFG		
HT.TY	Type of Heat Installed	0=No Heat 1=Gas 2=Electric		0 (50 series with no electric heat) 1 (48 series) 2 (50 series with electric heat)		HEATTYPE	18
N.HTR	Number of Heat Stages	1 to 2		1 (50 series <15kW) 2 (48 series, 50 series >=15kW)		NUM_HEAT	19
MRT.H	Heat Minimum On Time	60 to 999	sec	120		HMIN_ON	19
MOT.H	Heat Minimum Off Time	60 to 999	sec	120		HMIN_OFF	19
H.DEC	Heat Stage Decrease Time	120 to 999	sec	300		HSTAGDEC	19
H.INC	Heat Stage Increase Time	120 to 999	sec	450		HSTAGINC	19
FOD.E	Fan–off Delay, Elect Heat	10 to 600	sec	30		ELEC_FOD	15
FOD.G	Fan–off Delay, Gas Heat	45 to 600	sec	45		GAS_FOD	15
HT.LO	Heating Lockout Temp	40 to 125F	dF	75		OATLHEAT	18
SAT	SUPPLY AIR TEMPERATURE						
SAT.H	SAT Heat Mode Sensing	Enable/Disable		Disable		SAT_HEAT	18
SAM.L	Maximum SAT Lower Level	85 to 200	dF	140		SATMAX_L	19
SAM.U	Maximum SAT Upper Level	85 to 200	dF	160		SATMAX_H	19
SPT	SPACE TEMPERATURE						
HT.PD	SPT Heat Demand (+) Level	0.5 to 5	^F	1		HDEM_POS	
HT.ND	SPT Heat Demand (–) Level	–5 to –0.5	^F	–1		HDEM_NEG	
H.LAG	Heat Thermal Lag Factor	0 to 5	min	1		HEAT_LAG	
ECON	Economizer Configuration				ECON_CFG		
EC.EN	Economizer Installed	Yes/No		No: no FIOP Yes: FIOP		ECONO	19
E.CTL	Economizer Control Type	1=Dig/Position 2=Dig/Command 3=Analog Ctrl		1		ECON_CTL	20
MP.25	Econ Min at 25% Fanspeed	0 to 100	%	0		MINP_25	21
MP.50	Econ Min at 50% Fanspeed	0 to 100	%	0		MINP_50	21
MP.75	Econ Min at 75% Fanspeed	0 to 100	%	0		MINP_75	21
MP.MX	Econ Min at Max Fanspeed	0 to 100	%	30		MINP_MAX	21
EC.MX	Econo Cool Max Position	0 to 100	%	100		ECONOMAX	21
M.ANG	Min Actuator Ctrl Angle	75 to 90		88		MINANGLE	20
EH.LO	Econo Cool Hi Temp Limit	40 to 100F	dF	65		OATLECLH	21
EL.LO	Econo Cool Lo Temp Limit	–30 to 50F	dF	0		OATLECLL	21
DF.DB	Diff Dry Bulb Control	Disable/Enable		Enable		DIFFBULB	21
UEFC	Unoccupied Free Cooling	0=Disabled 1=Unoccupied 2=Preoccupancy		2		UEFC_CFG	21
FC.TM	Free Cool PreOcc Time	1 to 9999	min	120		UEFCTIME	21
FC.LO	Free Cool Low Temp Limit	–30 to 70F	dF	50		OATLUEFC	21
PE.EN	Power Exhaust Installed	Yes/No		No: no FIOP Yes: FIOP		PE_ENABL	21
PE1.C	Power Exhaust Stage1 CFM	100 to 15000	cfm	600		PE1_CFM	21
PE2.C	Power Exhaust Stage2 CFM	100 to 15000	cfm	0		PE2_CFM	21
IDF.C	Indoor Fan Max Speed CFM	500 to 15000	cfm	1600 (05) 2000 (06)		IDF_CFM	21
EN.SW	Enthalpy Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		ENTHLCFG	61

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 34 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB−TABLE	CCN POINT	PAGE NO.
AIR.Q	Air Quality Config.				IAQ_CFG		
IA.CF	IAQ Analog Input Config	0=No IAQ 1=DCV 2=Override IAQ 3=Ctrl Min Pos		0: no FIOP 1: FIOP		IAQANCFG	21
IA.FN	IAQ Analog Fan Config	0=Never 1=Occupied 2=Always		0		IAQANFAN	22
II.CF	IAQ Switch Input Config	0=No IAQ 1=DCV N/O 2=DCV N/C 3=Override N/O 4=Override N/C		0		IAQINCFG	23
II.FN	IAQ Switch Fan Config	0=Never 1=Occupied 2=Always		0		IAQINFAN	23
AQ.MN	Econo Min IAQ Position	0 to 100	%	10		IAQMINP	22
OVR.P	IAQ Override Position	0 to 100	%	100		IAQOVPOS	22
OA.CF	OAQ Analog Input Config	0=No OAQ 1=DCV 2=Lockout OAQ		0		OAQANCFG	23
OAQ.L	OAQ Lockout Limit	0 to 5000		600		OAQLOCK	23
AQD.L	AQ Differential Low	0 to 5000		100		DAQ_LOW	22
AQD.H	AQ Differential High	0 to 5000		700		DAQ_HIGH	22
DF.ON	Fan On AQ Differential	0 to 5000		600		DAQFNON	23
DF.OF	Fan Off AQ Differential	0 to 5000		200		DAQFNOFF	23
I.4M	IAQ Sensor Value at 4mA	0 to 5000		0		IAQ_4MA	22
I.20M	IAQ Sensor Value at 20mA	0 to 5000		2000		IAQ_20MA	22
O.4M	OAQ Sensor Value at 4mA	0 to 5000		0		OAQ_4MA	23
O.20M	OAQ Sensor Value at 20mA	0 to 5000		2000		OAQ_20MA	23
H.4M	RH Sensor Value at 4mA	0 to 50	%	0		RH_4MA	17
H.20M	RH Sensor Value at 20mA	60 to 100	%	100		RH_20MA	17
ALM.O	Alarm Relay Config.				ALM_CFG		25
A.SPC	SPT/SPRH Sensor Failure	Yes/No		Yes		SPACE_AL	
A.SRT	SAT/RAT Sensor Failure	Yes/No		Yes		SATRATAL	
A.OAT	OAT Thermistor Failure	Yes/No		Yes		OAT_AL	
A.CS	Current Sensor Failure	Yes/No		No		CS_AL	
A.CMP	Compressor Failure	Yes/No		Yes		COMP_AL	
A.CKT	Refrig Circuit Failure	Yes/No		Yes		CKT_AL	
A.SSP	SSP Transducer Failure	Yes/No		Yes		SSP_AL	
A.SCT	SCT Thermistor Failure	Yes/No		Yes		SCT_AL	
A.FAN	Indoor Fan Failure	Yes/No		Yes		FAN_AL	
A.FIL	Dirty Filter	Yes/No		Yes		FILT_AL	
A.ECO	Economizer Failure	Yes/No		Yes		ECON_AL	
PID	PID Configurations				PID_CFG		
EC.P	Economizer PID − kP	0.0 to 99.9		2.5		ECONO_P	
EC.I	Economizer PID − kI	0.0 to 99.9		0.1		ECONO_I	
EC.D	Economizer PID − kD	0.0 to 99.9		1		ECONO_D	
EC.DT	Economizer PID − rate	10.0 to 180.0	sec	15		ECONO_DT	
E.DBD	Economizer PID Deadband	0 to 25	%	3		ECONBAND	
CP.P	Capacity PID − kP	0 to 99.9		1.5		VCAP_P	
CP.I	Capacity PID − kI	0 to 99.9		0.1		VCAP_I	
CP.D	Capacity PID − kD	0 to 99.9		1		VCAP_D	
CP.DT	Capacity PID − rate	1 to 30	secs	5		VCAP_DT	
LK.P	Linkage Staging PID − kP	0.0 to 99.9		10		LINK_P	
LK.I	Linkage Staging PID − kI	0.0 to 99.9		5		LINK_I	
LK.D	Linkage Staging PID − kD	0.0 to 99.9		5		LINK_D	
LK.DT	Linkage Staging PID − rate	10.0 to 180.0	secs	30		LINK_DT	

Table 34 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB−TABLE	CCN POINT	PAGE NO.
(GENERIC = CCN only)					GENERICS		5
	POINT 01 Definition	8−char ASCII				Point_01	
	POINT 02 Definition	8−char ASCII				Point_02	
	POINT 03 Definition	8−char ASCII				Point_03	
	POINT 04 Definition	8−char ASCII				Point_04	
	POINT 05 Definition	8−char ASCII				Point_05	
	POINT 06 Definition	8−char ASCII				Point_06	
	POINT 07 Definition	8−char ASCII				Point_07	
	POINT 08 Definition	8−char ASCII				Point_08	
	POINT 09 Definition	8−char ASCII				Point_09	
	POINT 10 Definition	8−char ASCII				Point_10	
	POINT 11 Definition	8−char ASCII				Point_11	
	POINT 12 Definition	8−char ASCII				Point_12	
	POINT 13 Definition	8−char ASCII				Point_13	
	POINT 14 Definition	8−char ASCII				Point_14	
	POINT 15 Definition	8−char ASCII				Point_15	
	POINT 16 Definition	8−char ASCII				Point_16	
	POINT 17 Definition	8−char ASCII				Point_17	
	POINT 18 Definition	8−char ASCII				Point_18	
	POINT 19 Definition	8−char ASCII				Point_19	
	POINT 20 Definition	8−char ASCII				Point_20	
TRIM	Sensor Calibration				(CCN TRIM − see Maintenance Display)		
SPT.C	Space Temp Calibration	−30 to 130	dF				40
SPT.T	Space Temp Trim	−30 to 30	^F	0			40
SAT.C	Supply Air Temp Calib.	−30 to 130	dF				40
SAT.T	Supply Air Temp Trim	−30 to 30	^F	0			40
RAT.C	Return Air Temp Calib.	−30 to 130	dF				40
RAT.T	Return Air Temp Trim	−30 to 30	^F	0			40
CCN	CCN Configuration				CONFIGURATION 48_50_PD		
CCN.A	CCN Element Number	1 to 239		1		CCNADD	24
CCN.B	CCN Bus Number	0 to 239		0		CCNBUS	24
BAUD	CCN Baud Rate	2400, 4800, 9600, 19200, 38400		3		CCNBAUDD	24
BROD	CCN Broadcast Config.				BRODEFS		
B.TIM	CCN Time/Date Broadcast	Yes/No		No		CCNBC	24
B.OAT	CCN OAT Broadcast	Yes/No		No		OATBC	24
B.GS	Global Schedule Broadcast	Yes/No		No		GSBC	24
B.ACK	CCN Broadcast Ack'er	Yes/No		No		CCNBCACK	24
SCH.O	CCN Schedule Overrides				SCHEDOVR		
SCH.N	Schedule Number	0 = Always Occupied 1−64 = Local Schedule 65−99 = Global Schedule		0		SCHEDNUM	24
HOL.G	Accept Global Holidays	Yes/No		No		HOLIDAYT	24
OV.TL	Override Time Limit	0 to 4	hours	4		OTL	24
OV.EX	Timed Override Hours	0 to 4	hours	0		OVR_EXT	24
OV.SP	SPT Override Enabled	Yes/No		Yes		TIMEOVER	24
LDSH	CCN Schedule Overrides				LOADSHED		
S.GRP	Loadshed Group Number	0 to 16		0		SHED_NUM	25
R.MXC	Redline Max Capacity	0 to 100	%	100		MAXCREDL	25
S.MXC	Loadshed Max Capacity	0 to 100	%	100		MAXCSHED	
R.MXH	Redline Max Heat Stages	0 to 2		2		MAXHREDL	25
S.MXH	Loadshed Max Heat Stages	0 to 2		2		MAXHSHED	

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 35 – MODE - TIME CLOCK

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT
TIME CLOCK					CONFIGURATION	
TIME	Time of Day				TIME	
TIME	Hour and Minute	xx.xx	hh.mm			TIME
DATE	Current Date					
MNTH	Month of Year	January, February, &, December				MOY
DOM	Day of Month	1 to 31				DOM
YEAR	Year	xxxx				YOCDISP
DAY	Day of Week	Monday, Tuesday, &, Sunday				DOWDISP
DST	Daylight Savings Config.				BRODEFS (continued)	
STR.M	Start Month	January, February, &, December		3		STARTM
STR.W	Start Week	1 to 5		2		STARTW
STR.D	Start Day	1 to 7		7		STARTD
M.ADD	Minutes to Add	0 to 90		60		MINADD
STP.M	Stop Month	January, February, &, December		11		STOPM
STP.W	Stop Week	1 to 5		1		STOPW
STP.D	Stop Day	1 to 7		7		STOPD
M.SUB	Minutes to Subtract	0 to 90		60		MINSUB
SCH.L	Occupancy Schedule				(SCH.L = Display only)	
PER.x	Occupancy Period x					
OCC.x	Occupied From	00.00 to 23.59	hh.mm	00.00		PERxOCC
UNC.x	Occupied To	00.00 to 23.60	hh.mm	00.00		PERxUNC
MON.x	Monday in Period	Yes/No		No		PERxMON
TUE.x	Tuesday in Period	Yes/No		No		PERxTUE
WED.x	Wednesday in Period	Yes/No		No		PERxWED
THU.x	Thursday in Period	Yes/No		No		PERxTHU
FRI.x	Friday in Period	Yes/No		No		PERxFRI
SAT.x	Saturday in Period	Yes/No		No		PERxSAT
SUN.x	Sunday in Period	Yes/No		No		PERxSUN
HOL.x	Holiday in Period	Yes/No		No		PERxHOL
(repeat up to x=8 Periods)						
(OCCFECS = CCN only)					OCCDEFCS	
	Timed Override Hours	x	hours			OVR–EXT
	Period x DOW (MTWTFSSH)	xxxxxxxx		00000000		DOWx
	Occupied From	00.00 to 24.00	hh.mm	00.00		OCCTODx
	Occupied To	00.00 to 24.00	hh.mm	00.00		UNOCTODx
						(repeat up to x=8 Periods)
HOL.L	Holiday Schedule				HOLIDAY	
HOL.x	Holiday x			0	HOLDYxxS	
MON.x	Holiday Start Month	1 to 12 = January to December		0		HOLMONxx
DAY.x	Holiday Start Day	1 to 31		0		HOLDAYxx
LEN.x	Holiday Duration (days)	1 to 99		0		HOLLENxx
(repeat up to x=9 Holidays)						(repeat up to xx=30 Holidays)

Table 36 – CCN ONLY TABLES

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT
(ALARMDEF = CCN only)					ALARMDEF	
	Alarm Routing Control	00000000 to 11111111		11000000		ALRM_CNT
	Equipment Priority	0 to 7		4		EQP_TYPE
	Comm Failure Retry Time	1 to 240	min	10		RETRY_TM
	Re–Alarm Time	1 to 255	min	180		RE–ALARM
	Alarm System Name	up to 8 alphanum		48_50_PD		ALRM_NAM
(CTLRID = CCN only)					CTLR–ID	
	Device Name:	48_50_PD				
	Description:	text string				
	Location:	text string				
	Software Part Number:	CESR131459–XX–XX				
	Model Number:					
	Serial Number:					
	Reference Number:					

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 37 – MODE - OPERATING MODES

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
OPERATING MODES				MAINTENANCE DISPLAY			
MODE	Control Modes			MODES			
SYS	Unit operation disabled Unit operation enabled Service test enabled	1 of 3 texts will be displayed			SYS_MODE_TEXT1 SYS_MODE_TEXT2 (table only) SYS_MODE_TEXT3 (table only)		
HVAC	HVAC Operation Disabled Ventilation (fan–only) Cooling Unoccupied Free Cooling Heating	1 of 5 texts will be displayed			HVACMODE_TEXT_1 HVACMODE_TEXT_2 (table only) HVACMODE_TEXT_3 (table only)		
HV.DN	Remote HVAC Mode Disable	Yes/No			HVACDOWN	forcible	
EFF.C	Cool Setpoint in Effect	xxx.x			CSP_EFF		
EFF.H	Heat Setpoint in Effect	xxx.x			HSP_EFF		
OCC	Currently Occupied	Yes/No			OCCUPIED	forcible	forcible
T.OVR	Timed Override in Effect	Yes/No			MODETOVR		
LINK	Linkage Active	Yes/No			MODELINK		
D.LMT	Demand Limit In Effect	Yes/No			MODEDMDL		
C.LOC	Compressor OAT Lockout	Yes/No			COMPLOCK		
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK		
OK.EC	Ok to Use Economizer?	Yes/No			ECONCOOL		
COOL	Cool Mode Diagnostic			COOLDIAG			
COOL	In Cooling Mode?	Yes/No			IN_COOL		
OK.CL	OK to Select Cool Mode?	Yes/No			OKTOCOOL		
MS.TG	Mode Select Timeguard	xxx	secs		COOLMSTG		
OK.EC	OK to Use Economizer?	Yes/No			ECONCOOL		
OK.MC	OK to Use Compressor?	Yes/No			MECHCOOL		
C.LOC	Compressor OAT Lockout	Yes/No			COMPLOCK		
C.LO	Compressor Lockout Temp	xxx	dF		OATLCOMP		
IDF	Indoor Fan State	On/Off			IDFSTATE		
F.SPD	Commanded Fan Speed	xxx			FANSPEED		
REQ.C	Requested Cooling Capacity	xxx	%		REQ_CAPC		
MIN.C	Min Compressor Capacity	xxx	%		MIN_CAPC		
MAX.C	Max Compressor Capacity	xxx	%		MAX_CAPC		
LMT.C	Max Capacity In Effect	xxx	%		CAPLIMIT		
CAPC	Compressor Capacity	xxx	%		CAPACITY		
CTLR	Digital Scroll Ctrl Pwr	On/Off			COMPCTLR		
CMP.A	Compressor A Feedback	On/Off			COMP_A		
ST.A	Circuit A Strikes	x			ASTRIKES		
F.LEV	Outdoor Fan Level	x			FANLEV		
SAT	Supply Air Temperature						
SAT	Supply Air Temperature	xxx.x	dF		SAT_DISP		
SA.DM	Supply Air Temp Demand	xxx.x	^F		SAT_DMD		
SPT	Space Temperature						
SPT	Space Temperature	xxx.x	dF		SPACE_T	forcible	
TRND	Spacetemp Trend (F/min)	xxx.x			SPTTREND		
DMD.C	Cooling Demand	xxx.x	^F		COOL_DMD		

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 37 — MODE - OPERATING MODES (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB−TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
HEAT	Heat Mode Diagnostic			HEATDIAG			
HEAT	In Heating Mode?	Yes/No			IN_HEAT		
OK.HT	OK to Select Heat Mode?	Yes/No			OKTOHEAT		
MS.TG	Mode Select Timeguard	xxx	secs		HEATMSTG		
H.LOC	Heat OAT Lockout	Yes/No			HEATLOCK		
HT.LO	Heating Lockout Temp	xxx	dF		OATLHEAT		
IDF	Indoor Fan State	On/Off			IDFSTATE		
F.SPD	Commanded Fan Speed	xxx			FANSPEED		
AVL.H	Available Heating Stages	x			AVLHSTGS		
REQ.H	Requested Heating Stages	x			REQHSTGS		
LMT.H	Max Heat Stage In Effect	x			HSTGLIMT		
ACT.H	Actual Heating Stages	x			ACTHSTGS		
HT.1	Heat Stage 1 Relay	On/Off			HEAT_1		
HT.2	Heat Stage 2 Relay	On/Off			HEAT_2		
SAT	Supply Air Temperature						
SAT.H	SAT Heat Mode Sensing	Enable/Disable			SAT_HEAT		
SAT	Supply Air Temperature	xxx.x	dF		SAT_DISP		
SAM.L	Maximum SAT Lower Level	xxx	dF		SATMAX_L		
SAM.U	Maximum SAT Upper Level	xxx	dF		SATMAX_H		
SPT	Space Temperature						
SPT	Space Temperature	xxx.x	dF		SPACE_T	forcible	
DMD.H	Heating Demand	xxx.x	dF		HEAT_DMD		
TRND	Spacetemp Trend (F/min)	xxx.x			SPTTREND		
HT.PD	SPT Heat Demand (+) Level	xx.x	^F		HDEM_POS		
HT.ND	SPT Heat Demand (−) Level	xx.x	^F		HDEM_NEG		
H.LAG	Heat Thermal Lag Factor	x.x	min		HEAT_LAG		
ECON	Economizer Diagnostic			ECONDIAG			
EC.EN	Economizer Installed	Yes/No			ECONO		
OK.EC	Ok to Use Economizer?	Yes/No			ECONCOOL		
OCC	Currently Occupied	Yes/No			OCCUPIED	forcible	forcible
IDF	Indoor Fan State	On/Off			IDFSTATE		
F.SPD	Commanded Fan Speed	NNN			FANSPEED		
COOL	In Cooling Mode?	Yes/No			IN_COOL		
OAT	Outdoor Air Temperature	xxx.x	dF		OA_TEMP		
RAT	Return Air Temperature	xxx.x	dF		RETURN_T		
E.LOC	Econo Cool OAT Lockout	Yes/No			ECONLOCK		
D.LOC	Econo Diff DBulb Lockout	Yes/No			DFDBLOCK		
EH.LO	Econo Cool Hi Temp Limit	xxx	dF		OATLECLH		
EL.LO	Econo Cool Lo Temp Limit	xx	dF		OATLECLL		
FC.LO	Free Cool Low Temp Limit	xx	dF		OATLUEFC		
EN.LO	Econo Cool Enth Lockout	Yes/No			ENTHLOCK		
EC.MX	Econo Cool Max Position	xxx	%		ECONOMAX		
MP.MX	Econo Min at Max Fanspeed	xxx	%		MINP_MAX		
AQ.DV	IAQ DCV Mode	Yes/No			IN_IAQDV		
AQ.MN	Econo Min IAQ Position	xxx	%		IAQMINP		
AQ.OV	IAQ Override Mode	Yes/No			IN_IAQOV		
OVR.P	IAQ Override Position	xxx	%		IAQOVPOS		
AQ.LO	OAQ Lockout Mode	Yes/No			IN_OAQLO		
OAQ.L	OAQ Lockout Limit	xxxx			OAQLOCK		
LP.OV	Lo Refrig Press Override	Yes/No			IN_LPOV		
EC.CP	Econo Commanded Position	xxx	%		ECONOCMD	forcible	
EC.AP	Econo Actual Position	xxx	%		ECONOPOS		
EC.MP	Min Position in Effect	xxx	%		MIN_POS	forcible	
C.ANG	Actuator Control Angle				CTLANGLE		
E.CAL	Economizer Calibrating	Yes/No			ECOINCAL		
DMD.L	Demand Limiting			DMDL			
D.LMT	Demand Limit In Effect	Yes/No			MODEDMDL		
LMT.C	Max Capacity In Effect	xxx			CAPLIMIT		
LMT.H	Max Heat Stage In Effect	x			HSTGLIMT		
REDL	Redline Activated	Yes/No			MODEREDL		
SHED	Loadshed Activated	Yes/No			MODESHED		
MAX.C	Max Compressor Capacity	x			MAX_CAPC		forcible
MAX.H	Max Allowed Heat Stages	x			MAXHSTGS		forcible
(Display TRIM − see Configuration)	Sensor Calibration			TRIM			
	Space Temp Calibration	−30 to 130	dF		SPT_CAL	forcible	
	Space Temp Trim	−30 to 30	^F		SPT_OFF	forcible	
	Supply Air Temp Calib.	−30 to 130	dF		SAT_CAL	forcible	
	Supply Air Temp Trim	−30 to 30	^F		SAT_OFF	forcible	
	Return Air Temp Calib.	−30 to 130	dF		RAT_CAL	forcible	
	Return Air Temp Trim	−30 to 30	^F		RAT_OFF	forcible	

APPENDIX A - LOCAL DISPLAY AND CCN TABLES (CONT)

Table 37 — MODE - OPERATING MODES (cont)

ITEM	EXPANSION	RANGE	UNITS	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
(OCCDEFM = CCN only)	Occupancy Supervisory			OCCDEFM			
	Current Mode (1=Occup)	0,1			MODE		
	Current Occup Period #	0 to 8			PER_NO		
	Time–Override in Effect	Yes/No			OVERLAST		
	Time–Override Duration	0 to 4	hours		OVR_HRS		
	Current Occupied Time	xx.xx	hh:mm		STRTTIME		
	Current Unoccupied Time	xx.xx	hh:mm		ENDTIME		
	Next Occupied Day				NXTOCDAY		
	Next Occupied Time	xx.xx	hh:mm		NXTOCTIM		
	Next Unoccupied Day				NXTUNDAY		
	Next Unoccupied Time	xx.xx	hh:mm		NXTUNTIM		
	Previous Unoccupied Day				PRVUNDAY		
	Previous Unoccupied Time	xx.xx	hh.mm		PRVUNTIM		
(LINKDATA = CCN only)	CCN – Linkage			LINKDATA			
	Supervisory Element #	xxx			SUPE–ADR		
	Supervisory Bus	xxx			SUPE–BUS		
	Supervisory Block Number	xxx			BLOCKNUM		
	Average Occup. Heat Stp.	xxxx.x	dF		AOHS		
	Average Occup. Cool Stp.	xxxx.x	dF		AOCS		
	Average Unocc. Heat Stp.	xxxx.x	dF		AUHS		
	Average Unocc. Cool Stp.	xxxx.x	dF		AUCS		
	Average Zone Temperature	xxxx.x	dF		AZT		
	Average Occup. Zone Temp	xxxx.x	dF		AOZT		
	Linkage System Occupied?	Yes/No			LOCC		
	Next Occupied Day	”Mon”, ”Tue”, & , ”Sun”	3–char text		LNEXTOCD		
	Next Occupied Time	xx:xx	hh:mm		LNEXTOCC	forcible	
	Next Unoccupied Day	”Mon”, ”Tue”, & , ”Sun”	3–char text		LNEXTUOD		
	Next Unoccupied Time	xx:xx	hh:mm		LNEXTUNC	forcible	
	Last Unoccupied Day	”Mon”, ”Tue”, & , ”Sun”	3–char text		LLASTUOD		
	Last Unoccupied Time	xx:xx	hh:mm		LLASTUNC	forcible	

Table 38 – MODE - ALARMS

ITEM	EXPANSION	RANGE	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT	CCN WRITE STATUS	DISPLAY WRITE STATUS
				MAINTENANCE DISPLAY			
ALARMS				ALARMS			
R.CUR	Reset All Current Alarms	Yes/No	No		ALRESET	forcible	forcible
R.HIS	Reset Alarm History	Yes/No	No		ALHISCLR	forcible	forcible
CURR	Currently Active Alarms						
alarm#	text string				ALARM01C – ALARM25C		
(repeat up to 25 alarms)							
HIST	Alarm History			ALARM HISTORY			
alarm#	alarm# – mm/dd/yy – hh.mm – text string						
(repeat up to 20 Alarms)							

APPENDIX B - VFD INFORMATION

On 48/50PD units, the supply fan speed is controlled by a 3-phase VFD. The VFD is located in the supply fan section behind an indoor fan scroll. The VFD speed is controlled directly by the *Comfort*Link™ controls through a 0-10Vdc signal based on a space temperature sensor. The VFD has a display, which can be used for service diagnostics, but setup of the control is to be done through the scrolling marquee display.

The VFD is powered during normal operation to prevent condensation from forming on the boards during the off mode and is stopped by driving the speed to 0 (by sending a 0Vdc signal to the VFD). The units use ABB VFDs. The interface wiring for the VFDs is shown in the figure below. The VFD connects to *Comfort*Link through a 0-10Vdc output on the AUX1 board. Terminal designations are shown in the Terminal Designation table. Configurations are shown in the VFD Configurations table.

Table 39 – VFD TERMINAL DESIGNATIONS

TERMINAL	FUNCTION
U1 V1 W1	Three–Phase main circuit input power supply
U2 V2 W2	Three–Phase AC output to motor, 0V to maximum input voltage level
X1–11 (GND) X1–12 (COMMON)	Factory–supplied jumper
X1–10 (24VDC) X1–13 (DI–1)	Run (factory–supplied jumper)
X1–10 (24VDC) X1–16 (DI–4)	Start Enable 1 (factory–supplied jumper). When opened, the drive goes to emergency stop
X1–2 (AI–1) X1–3 (AGND)	Factory wired for 0–10Vdc remote input

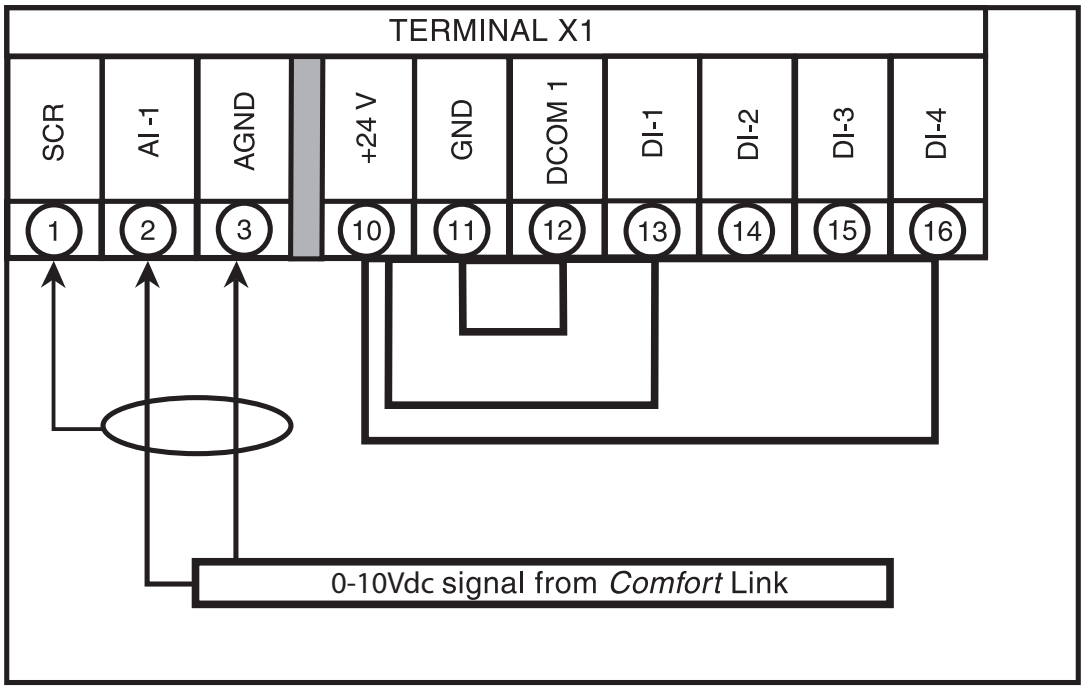

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Fig. 41 - VFD Wiring

APPENDIX B - VFD INFORMATION (CONT)

Table 40 – VFD CONFIGURATIONS

APPLICATION CRITICAL DRIVE PARAMETERS FOR ABB ACH550 DRIVES						
Parameter Group	**Parameter Number**	**Description**	**Value**		**UNITS**	**NOTE**
			HK30WA001–208/230V	**HK30WA008–460V**		
START–UP DATA	9901	Language	(0) English		–	ABB Drive default
	9902	Application Macro	(1) HVAC Default		–	PD Product specific setting
	9904	Motor Control Mode	(3) Scalar : Freq		–	ABB Drive default
	9905	Motor Nominal Voltage	230	460	Volts	PD Product specific setting
	9906	Motor Nominal Current	7.0	3.5	Amps	PD Product specific setting
	9907	Motor Nominal Frequency	60		Hz	ABB Drive default
	9908	Motor Nominal Speed	1725		RPM	PD Product specific setting
	9909	Motor Nominal Power	2.4		HP	PD Product specific setting
START/STOP/DIR	1001	EXT1 Commands	(1) DI – 1 Start/Stop		–	ABB Drive default
	1002	EXT2 Commands	(1) DI – 1 Start/Stop		–	ABB Drive default
	1003	Direction	(1) Forward		–	PD Product specific setting
ANALOG INPUTS	1301	Minimum AI – 1	20		%	ABB Drive default
	1302	Maximum AI – 1	100		%	ABB Drive default
RELAY OUTPUTS	1401	Relay Output 1	(7) Started		–	Carrier default settings from PPS
	1402	Relay Output 2	(2) Run		–	ABB Drive default
	1403	Relay Output 3	(3) Fault (–1)		–	ABB Drive default
SYSTEM CONTROL	1601	Run Enable	(0) Not Set		–	ABB Drive default
	1608	Start Enable 1	(4) DI – 4		–	ABB Drive default
OVER RIDE	1701	Override Set	(3) DI – 3		–	Carrier default settings from PPS
	1702	Override Freq	60		Hz	Carrier default settings from PPS
	1703	Override Speed	1750		RPM	Carrier default settings from PPS
	1704	Over Pass Code	0		–	Carrier default settings from PPS
	1705	Override	On		–	Carrier default settings from PPS
LIMITS	2003	Maximum Current	8.0	4.0	Amps	PD Product specific setting
	2007	Minimum Frequency	0		Hz	ABB Drive default
	2008	Maximum Frequency	60		Hz	ABB Drive default
START/STOP	2101	Start Function	(8) Ramp		–	PD Product specific setting
	2102	Stop Function	(2) Ramp		–	PD Product specific setting
ACCEL/DECEL	2202	Accelerate Time	30		Seconds	ABB Drive default
	2203	Decelerate Time	30		Seconds	ABB Drive default
MOTOR	2601	Flux Optimization	(1) On		–	PD Product specific setting
	2605	Volt/Freq Ratio	(2) Squared		–	Carrier default settings from PPS
	2606	Switching Frequency	8		kHz	Carrier default settings from PPS
FAULT FUNCTIONS	3006	Motor Thermal Time	1050		Seconds	Carrier default settings from PPS
PANEL DISPLAY PROCESS VALUES	3415	Signal 3 Parameter	(120) AI1		–	ABB Drive Default
	3416	Signal 3 Minimum	0		–	ABB Drive Default
	3417	Signal 3 Maximum	100		–	ABB Drive Default
	3418	Output 3 DSP Form	(5) + 0.0		–	ABB Drive Default
	3419	Output 3 DSP Units	(127) Vdc		–	PD Product Specific Setting
	3420	Output 3 Minimum	0		Vdc	PD Product Specific Setting
	3421	Output 3 Maximum	10		Vdc	PD Product Specific Setting
All Other Parameter Settings are ABB Drive Default Settings						

VFD Operation

The VFD keypad is shown in Fig. 42. The function of SOFT KEYS 1 and 2 change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. The UP and DOWN keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

For the VFD to operate on the 48/50PD units, the drive must be set in AUTO mode. The word "AUTO" will appear in the upper left hand corner of the VFD display. Press the AUTO button to set the drive in AUTO mode.

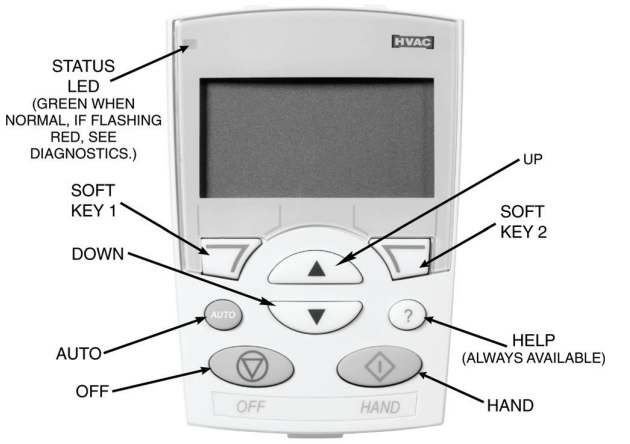

Fig. 42 - VFD Keypad

Start Up with Assistant

Initial start-up has been performed at the factory. Use of the start up assistant will override factory VFD configurations. See below to check that all parameters listed in VFD Configurations table are correctly configured on the VFD.

Start Up by Changing Parameters Individually

Initial start-up is performed at the factory. To start up the VFD with by changing individual parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the application macro "HVAC Default."

VFD Modes

The VFD has several different modes for configuring, operating, and diagnosing the VFD. The modes are:

- Standard Display mode — shows drive status information and operates the drive
- Parameters mode — edits parameter values individually
- Start-up Assistant mode — guides the start up and configuration
- Changed Parameters mode — shows all changed parameters
- Drive Parameter Backup mode — stores or uploads the parameters
- Clock Set mode — sets the time and date for the drive
- I/O Settings mode — checks and edits the I/O settings

Standard Display Mode

Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press EXIT until the LCD display shows status information as described below. (See Fig. 43.)

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O (X1) or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For 48/50PD units, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain.

Using parameter group 34, the middle of the LCD display can be configured to display 3 parameter values. The default display shows parameters 0103 (OUTPUT FREQ) in percent speed, 0104 (CURRENT) in amperes, and 0120 (Al1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

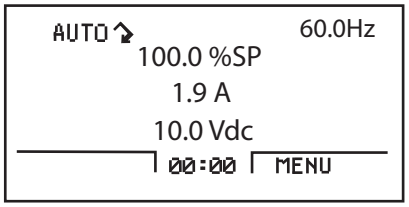

Fig. 43 - Standard Display Example

To adjust the speed in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

Parameters Mode

The Parameters mode is used to change the parameters on the drive. To change parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the Carrier application macro.

Start-Up Assistant Mode

To use the Start-Up Assistant, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight ASSISTANTS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight Commission Drive and press SEL (SOFT KEY 2).
4. The Start-Up Assistant will display the parameters that need to be configured. Select the desired values and press SAVE (SOFT KEY 2) after every change. The process will continue until all the parameters are set. The assistant checks to make sure that entered values are in range.

The assistant is divided into separate tasks. The user can activate the tasks one after the other or independently. The tasks are typically done in this order: Application, References 1 and 2, Start/Stop Control, Protections, Constant Speeds, PID Control, Low Noise Setup, Panel Display, Timed Functions, and Outputs.

Changed Parameters Mode

The Changed Parameters mode is used to view and edit recently changed parameters on the drive. To view the changed parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight CHANGED PAR on the display screen and press ENTER (SOFT KEY 2). A list of the recently changed parameters will be displayed.
3. Use the UP or DOWN keys to highlight the desired parameter group and press EDIT (SOFT KEY 2) to change the parameter if desired.
4. Press EXIT (SOFT KEY 1) to exit the Changed Parameters mode.

Drive Parameter Backup Mode

The drive parameter back up mode is used to export the parameters from one drive to another. The parameters can be uploaded from a VFD to the removable control panel. The control panel can then be transferred to another drive and the parameters downloaded into memory.

Depending on the motor and application, there are two options available. The first option is to download all parameters. This copies both application and motor parameters to the drive from the control panel. This is recommended when using the same application for drives of the same size. This can also be used to create a backup of the parameters group for the drive.

The second option downloads only the application parameters to the drive. This is recommended when using the same application for drives of different sizes. Parameters 9905, 9906, 9907, 9908, 9909, 1605, 1607, 5201, and group 51 parameters and internal motor parameters are not copied.

Upload All Parameters

To upload and store parameters in the control panel from the VFD, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight UPLOAD TO PANEL and press SEL (SOFT KEY 2).
4. The text “Copying Parameters” will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
5. When the upload is complete, the text “Parameter upload successful” will be displayed.
6. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
7. The control panel can now be disconnected from the drive.

Download All Parameters

To download all parameters from the control panel to the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD TO DRIVE ALL and press SEL (SOFT KEY 2).
5. The text “Restoring Parameters” will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text “Parameter download successful” will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

Download Application Parameters

To download application parameters only to the control panel from the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD APPLICATION and press SEL (SOFT KEY 2).
5. The text "Downloading Parameters (partial)" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

Clock Set Mode

The clock set mode is used for setting the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs.

To set the clock, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight CLOCK SET on the display screen and press ENTER (SOFT KEY 2). The clock set parameter list will be displayed.
3. Use the UP or DOWN keys to highlight CLOCK VISIBILITY and press SEL (SOFT KEY 2). This parameter is used to display or hide the clock on the screen. Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
4. Use the UP or DOWN keys to highlight SET TIME and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the hours and minutes. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
5. Use the UP or DOWN keys to highlight TIME FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
6. Use the UP or DOWN keys to highlight SET DATE and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the day, month, and year. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
8. Press EXIT (SOFT KEY 1) twice to return to the main menu.

I/O Settings Mode

The I/O Settings mode is used for viewing and editing the I/O settings.

To configure the I/O settings, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press ENTER (SOFT KEY 2). The I/O Settings parameter list will be displayed.
3. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to select the parameter to view. Press OK (SOFT KEY 2).
5. Use the UP or DOWN keys to change the parameter setting. Press SAVE (SOFT KEY 2) to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
6. Press EXIT (SOFT KEY 1) twice to return to the main menu.

VFD Diagnostics

The drive detects error situations and reports them using:

- Green and red LEDs on the body of the drive (located under the keypad)
- Status LED on the control panel
- Control panel display
- The Fault Word and Alarm Word parameter bits (parameters 0305 to 0309)

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

Faults (Red LED Lit)

The VFD signals that it has detected a severe error, or fault, by:

- Enabling the red LED on the drive (LED is either steady or flashing)
- Setting an appropriate bit in a Fault Word parameter (0305 to 0307)
- Overriding the control panel display with the display of a fault code
- Stopping the motor (if it was on)
- Sets an appropriate bit in Fault Word parameter 0305- 0307.

The fault code on the control panel display is temporary. Pressing the MENU, ENTER, UP button or DOWN buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

Alarms (Green LED Flashing)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

- Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
- Sets an appropriate bit in an Alarm Word parameter (0308 or 0309)
- Overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

Correcting Faults

The recommended corrective action for faults is shown in the Fault Listing Table 41. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter 1604 (FAULT RESET SELECT), digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

History

For reference, the last three fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402 through 0411) to aid in troubleshooting a problem. For example, a parameter 0404 stores the motor speed at the time of the fault. To clear the fault history (all of Group 04, Fault History parameters), follow these steps:

1. In the control panel, Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press the UP and DOWN buttons simultaneously.
4. Press SAVE.

Correcting Alarms

To correct alarms, first determine if the Alarm requires any corrective action (action is not always required). Use Table 42 to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact ABB Automation Inc., at 1-800-435-7365, option 4, option 3. A qualified technician will review the problem with the caller and make a determination regarding how to proceed. This may involve dispatching a designated service station (DSS) representative from an authorized station, dispatching a replacement unit, or advising return for repair.

VFD Maintenance

If installed in an appropriate environment, the VFD requires very little maintenance.

Table 43 lists the routine maintenance intervals recommended by Carrier.

Heat Sink

The heat sink fins accumulate dust from the cooling air. Since a dusty sink is less efficient at cooling the drive, overtemperature faults become more likely. In a normal environment check the heat sink annually, in a dusty environment check more often.

Check the heat sink as follows (when necessary):

1. Remove power from drive.
2. Remove the cooling fan.
3. Blow clean compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. If there a risk of the dust entering adjoining equipment, perform the cleaning in another room.
4. Replace the cooling fan.
5. Restore power.

APPENDIX B - VFD INFORMATION (CONT)

Table 41 – FAULT CODES

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1	OVERCURRENT	Output current is excessive. Check for excessive motor load, insufficient acceleration time (parameters 2202 ACCELER TIME 1, default 30 seconds), or faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for static or transient over voltages in the input power supply, insufficient deceleration time (parameters 2203 DECELER TIME 1, default 30 seconds), or undersized brake chopper (if present).
3	DEV OVERTEMP	Drive heat sink is overheated. Temperature is at or above 115°C (239°F). Check for fan failure, obstructions in the air flow, dirt or dust coating on the heat sink, excessive ambient temperature, or excessive motor load.
4	SHORT CIRC	Fault current. Check for short–circuit in the motor cable(s) or motor or supply disturbances.
5	OVERLOAD	Inverter overload condition. The drive output current exceeds the ratings.
6	DC OVERVOLT	Intermediate circuit DC voltage is not sufficient. Check for missing phase in the input power supply, blown fuse, or under voltage on main circuit.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1 FLT LIMIT (3021). Check source and connection for analog input and parameter settings for AI1 FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2 FLT LIMIT (3022). Check source and connection for analog input and parameter settings for AI2 FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT OVERTEMP	Motor is too hot, as estimated by the drive. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either drive is in local control mode (the control panel displays LOC), or drive is in remote control mode (REM) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check the communication lines and connections. Check parameter 3002 PANEL COMM ERROR, parameters in Group 10: Command Inputs and Group 11:Reference Select (if drive operation is REM).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check motor connections.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for excessive load or insufficient motor power. Check parameters 3010 through 3012.
13	RESERVED	Not used.
14	EXT FAULT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXT FAULT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.
16	EARTH FAULT	The load on the input power system is out of balance. Check for faults in the motor or motor cable. Verify that motor cable does not exceed maximum specified length.
17	UNDERLOAD	Motor load is lower than expected. Check for disconnected load. Check parameters 3013 UNDERLOAD FUNCTION through 3015 UNDERLOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact Carrier.
19	OPEX LINK	Internal fault. A communication–related problem has been detected between the OMIO and OINT boards. Contact Carrier.
20	OPEX PWR	Internal fault. Low voltage condition detected on the OINT board. Contact Carrier.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact Carrier.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for missing main phase or blown fuse.
23	RESERVED	Not used.
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED parameters. Check parameter settings for 2001 and 2002. Check adequacy of motor braking torque. Check applicability of torque control. Check brake chopper and resistor.
25	RESERVED	Not used.
26	DRIVE ID	Internal fault. Configuration block drive ID is not valid.
27	CONFIG FILE	Internal configuration file has an error. Contact Carrier.
28	SERIAL 1 ERR	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
29	EFB CON FILE	Error in reading the configuration file for the field bus adapter.
30	FORCE TRIP	Fault trip forced by the field bus. See the field bus reference literature.
31	EFB 1	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
32	EFB 2	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
33	EFB 3	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for motor fault, motor cable fault, thermal relay fault , or internal fault.
35	OUTP WIRING	Error in power wiring suspected. Check that input power wired to drive output. Check for ground faults.
101 – 105	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
201 – 206	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.

APPENDIX B - VFD INFORMATION (CONT)

Table 41 — FAULT CODES (cont)

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1000	PAR HZRPM	Parameter values are inconsistent. Check for any of the following: 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: −128/+128 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: −128/+128 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: − 128/+128 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: − 128/+128
1001	PAR PFA REFNG	Parameter values are inconsistent. Check that 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
1002	PAR PFA IOCNF	Parameter values are inconsistent. The number of programmed PFA relays does not match with Interlock configuration, when 8123 PFA ENABLE is active. Check consistency of RELAY OUTPUT parameters 1401 through 1403, and 1410 through 1412. Check 8117 NR OF AUX MOTORS, 8118 AUTOCHANGE INTERV, and 8120 INTERLOCKS.
1003	PAR AI SCALE	Parameter values are inconsistent. Check that parameter 1301 AI 1 MIN > 1302 AI 1 MAX and that parameter 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check that parameter 1504 AO 1 MIN > 1505 AO 1 MAX and that parameter 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check the following parameters: 1.1 < (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / PN) < 2.6 Where: PN = 1000 * 9909 MOTOR NOM POWER (if units are kW) or PN = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g., in US)
1006	PAR EXT RO	Parameter values are inconsistent. Check the extension relay module for connection and 1410 through 1412 RELAY OUTPUTS 4 through 6 have non−zero values.
1007	PAR FBUS	Parameter values are inconsistent. Check that a parameter is set for field bus control (e.g., 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFA MODE	Parameter values are inconsistent. The 9904 MOTOR CTRL MODE must = 3 (SCALAR SPEED) when 8123 PFA ENABLE activated.
1009	PAR PCU 1	Parameter values for power control are inconsistent or improper motor nominal frequency or speed. Check for both of the following: 1 < (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED < 16 0.8 < 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor poles) < 0.992
1010	OVERRIDE/PFA CONFLICT	Override mode is enabled and PFA is activated at the same time. This cannot be done because PFA interlocks cannot be observed in the override mode.

APPENDIX B - VFD INFORMATION (CONT)

Table 42 – ALARM CODES

ALARM CODE	ALARM NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
2001	–	Reserved
2002	–	Reserved
2003	–	Reserved
2004	DIR LOCK	The change in direction being attempted is not allowed. Do not attempt to change the direction of motor rotation, or Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3021) and the parameter that sets the Alarm/Fault operation (3001).
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check input source and connections. Check parameter that sets the minimum (3022) and the parameter that sets the Alarm/Fault operation (3001).
2008	PANEL LOSS	Panel communication is lost and either the VFD is in local control mode (the control panel displays HAND), or the VFD is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections, Parameter 3002 PANEL LOSS, and parameters in groups 10 COMMAND INPUTS and 11 REFERENCE SELECT (if drive operation is REM).
2009	–	Reserved
2010	MOT OVERTEMP	Motor is hot, based on either the VFD estimate or on temperature feedback. This alarm warns that a Motor Overload fault trip may be near. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check that the motor and drive ratings match (motor is NOT undersized for the drive). Check the settings on parameters 3013 to 3015.
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013*	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. To control automatic reset, use parameter group 31 (AUTOMATIC RESET).
2014	AUTOCHANGE	This alarm warns that the PFA autochange function is active. To control PFA, use parameter group 81 (PFA) and the Pump Alternation macro.
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start any motor (when Autochange is used), or a speed regulated motor (when Autochange is not used).
2016	–	Reserved
2017*	OFF BUTTON	This alarm indicates that the OFF button has been pressed.
2018	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. To control PID sleep, use parameters 4022 through 4026 or 4122 through 4126.
2019	ID RUN	The VFD is performing an ID run.
2020	OVERRIDE	Override mode is activated.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. To control Start Enable 1 function, use parameter 1608. To correct, check the digital input configuration and the communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. To control Start Enable 2 function, use parameter1609. To correct, check the digital input configuration and the communication settings.
2023	EMERGENCY STOP	Emergency stop is activated.

* This alarm is not indicated by a relay output, even when the relay output is configured to indicate alarm conditions, parameter 1401 RELAY OUTPUT = 5 (ALARM) or 16 (FLT/ALARM).

Table 43 – MAINTENANCE INTERVALS

MAINTENANCE	INTERVAL
Heat sink temperature check and cleaning	Every 6 to 12 months (depending on the dustiness of the environment)
Main cooling fan replacement	Every five years
HVAC Control panel battery change	Every ten years

Main Fan Replacement

The main cooling fan of the VFD has a life span of about 60,000 operating hours at maximum rated operating temperature and drive load. The expected life span doubles for each 18°F drop in the fan temperature (fan temperature is a function of ambient temperatures and drive loads).

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heat sink temperature in spite of heat sink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from Carrier.

To replace the main fan for frame sizes R1 through R2, perform the following (see Main Fan Replacement figure):

1. Remove power from drive.
2. Remove drive cover.
3. For frame sizes R1 and R2, press together the retaining clips on the fan cover and lift.
4. Disconnect the fan cable.
5. Install the new fan by reversing Steps 2 to 4.
6. Restore power.

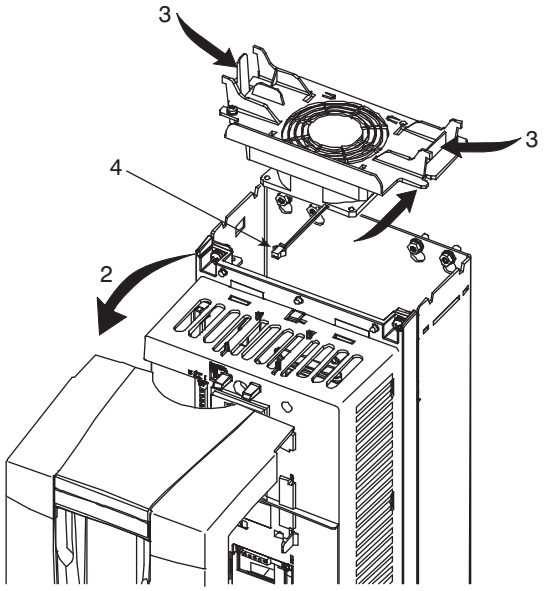

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Fig. 44 - Main Fan Replacement (Frame Sizes R1-R2)

Control Panel Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery Replacement

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

APPENDIX C - START-UP DATA

Table 44 – Fan Performance - 48PDD05 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	504	0.16	613	0.23	710	0.31	798	0.40	881	0.49
1300	527	0.19	632	0.27	725	0.35	810	0.44	890	0.54
1400	551	0.22	652	0.31	741	0.40	823	0.49	900	0.59
1500	576	0.26	673	0.35	759	0.44	838	0.54	912	0.65
1600	600	0.30	694	0.40	777	0.50	854	0.60	926	0.71
1700	626	0.35	716	0.45	797	0.55	871	0.66	941	0.78
1800	651	0.40	739	0.51	817	0.62	889	0.73	957	0.85
1900	677	0.46	762	0.57	838	0.69	908	0.80	974	0.93
2000	703	0.52	785	0.64	859	0.76	927	0.88	992	1.01

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	957	0.59	1030	0.70	1098	0.80	1163	0.91	1225	1.03
1300	964	0.64	1035	0.75	1102	0.86	1166	0.98	1227	1.10
1400	973	0.70	1042	0.81	1107	0.92	1170	1.04	1231	1.17
1500	983	0.76	1050	0.87	1114	0.99	1176	1.12	1235	1.24
1600	994	0.82	1060	0.94	1122	1.06	1183	1.19	1241	1.32
1700	1007	0.89	1071	1.02	1132	1.14	1191	1.27	1248	1.41
1800	1021	0.97	1083	1.10	1143	1.23	1200	1.36	1256	1.50
1900	1037	1.05	1097	1.18	1155	1.32	1211	1.45	1266	1.60
2000	1053	1.14	1111	1.27	1168	1.41	1223	1.55	1276	1.70

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 45 – Fan Performance - 48PDE05 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	509	0.16	618	0.24	714	0.32	802	0.41	884	0.50
1300	533	0.19	637	0.27	730	0.36	814	0.45	894	0.55
1400	557	0.23	658	0.31	746	0.40	828	0.50	905	0.60
1500	582	0.27	679	0.36	764	0.45	843	0.55	917	0.66
1600	608	0.31	701	0.40	783	0.50	860	0.61	931	0.72
1700	634	0.36	723	0.46	803	0.56	877	0.67	947	0.79
1800	660	0.41	747	0.52	824	0.63	896	0.74	963	0.86
1900	686	0.47	770	0.58	846	0.70	915	0.82	981	0.94
2000	713	0.54	795	0.66	868	0.78	935	0.90	999	1.02

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	961	0.60	1033	0.70	1101	0.81	1166	0.92	1228	1.03
1300	968	0.65	1039	0.76	1106	0.87	1169	0.98	1230	1.10
1400	977	0.70	1046	0.82	1111	0.93	1174	1.05	1234	1.17
1500	987	0.77	1054	0.88	1118	1.00	1180	1.12	1239	1.25
1600	999	0.83	1065	0.95	1127	1.07	1187	1.20	1245	1.33
1700	1013	0.90	1076	1.03	1137	1.15	1196	1.28	1253	1.42
1800	1027	0.98	1089	1.11	1148	1.24	1206	1.37	1261	1.51
1900	1043	1.06	1103	1.20	1161	1.33	1217	1.47	1271	1.61
2000	1060	1.16	1118	1.29	1175	1.43	1229	1.57	1282	1.72

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 46 – Fan Performance - 48PDF05 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	520	0.17	628	0.24	723	0.33	811	0.41	892	0.51
1300	545	0.20	648	0.28	739	0.37	823	0.46	902	0.56
1400	570	0.24	668	0.32	756	0.41	837	0.51	913	0.61
1500	596	0.28	691	0.37	775	0.46	853	0.56	927	0.67
1600	623	0.32	714	0.42	795	0.52	870	0.62	942	0.73
1700	650	0.37	737	0.48	816	0.58	889	0.69	958	0.80
1800	677	0.43	762	0.54	838	0.65	909	0.76	976	0.88
1900	705	0.50	787	0.61	861	0.72	929	0.84	994	0.97
2000	734	0.57	813	0.68	884	0.80	951	0.93	1014	1.06

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	968	0.61	1040	0.71	1108	0.82	1172	0.93	1233	1.04
1300	976	0.66	1046	0.77	1112	0.88	1176	1.00	1237	1.11
1400	985	0.72	1054	0.83	1119	0.95	1181	1.07	1241	1.19
1500	996	0.78	1063	0.90	1127	1.02	1188	1.14	1247	1.27
1600	1009	0.85	1074	0.97	1136	1.09	1196	1.22	1254	1.35
1700	1024	0.92	1087	1.05	1147	1.17	1205	1.31	1262	1.44
1800	1039	1.00	1100	1.13	1159	1.26	1216	1.40	1272	1.54
1900	1056	1.09	1116	1.22	1173	1.36	1229	1.50	1283	1.64
2000	1074	1.19	1132	1.32	1188	1.46	1242	1.61	1295	1.75

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 47 – Fan Performance - 48PDD06 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	593	0.27	688	0.37	773	0.46	851	0.56	925	0.67
1600	620	0.32	711	0.42	793	0.52	868	0.62	939	0.73
1700	646	0.37	734	0.47	813	0.58	886	0.69	955	0.80
1800	673	0.43	758	0.53	835	0.64	905	0.76	972	0.88
1900	700	0.49	783	0.60	857	0.72	925	0.84	990	0.96
2000	728	0.56	807	0.68	879	0.80	946	0.92	1009	1.05
2100	755	0.63	833	0.76	903	0.88	968	1.01	1029	1.14
2200	783	0.71	858	0.84	926	0.97	990	1.11	1050	1.24
2300	811	0.80	884	0.94	950	1.07	1012	1.21	1071	1.35
2400	840	0.90	910	1.04	975	1.18	1035	1.33	1092	1.47
2500	868	1.00	937	1.15	1000	1.30	1059	1.45	1115	1.60

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	995	0.78	1061	0.89	1125	1.01	1186	1.14	1245	1.26
1600	1007	0.85	1072	0.96	1134	1.09	1194	1.22	1252	1.35
1700	1021	0.92	1084	1.04	1145	1.17	1203	1.30	1260	1.44
1800	1036	1.00	1098	1.13	1157	1.26	1214	1.39	1269	1.53
1900	1053	1.08	1112	1.22	1170	1.35	1226	1.49	1280	1.63
2000	1070	1.18	1128	1.31	1184	1.45	1238	1.60	1291	1.74
2100	1088	1.28	1145	1.42	1199	1.56	1253	1.71	1304	1.86
2200	1107	1.38	1162	1.53	1216	1.68	1268	1.83	1318	1.98
2300	1127	1.50	1181	1.65	1233	1.80	1284	1.95	1333	2.11
2400	1147	1.62	1200	1.77	1251	1.93	1300	2.09	1349	2.25
2500	1168	1.75	1220	1.91	1270	2.07	1318	2.23	1365	2.40

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 48 – Fan Performance - 48PDE06 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	607	0.29	700	0.38	784	0.47	861	0.57	934	0.68
1600	634	0.33	724	0.43	804	0.53	879	0.64	950	0.75
1700	662	0.39	748	0.49	826	0.60	898	0.71	967	0.82
1800	690	0.45	773	0.55	848	0.67	918	0.78	985	0.90
1900	719	0.51	799	0.63	872	0.74	940	0.86	1004	0.98
2000	748	0.59	825	0.70	896	0.83	962	0.95	1024	1.08
2100	777	0.67	852	0.79	920	0.92	985	1.05	1045	1.18
2200	807	0.75	879	0.88	946	1.01	1008	1.15	1067	1.29
2300	837	0.85	907	0.98	971	1.12	1032	1.26	1090	1.40
2400	867	0.95	935	1.09	998	1.24	1057	1.38	1113	1.53
2500	897	1.06	963	1.21	1024	1.36	1082	1.51	1137	1.66

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	1004	0.79	1070	0.91	1133	1.03	1194	1.15	1253	1.28
1600	1017	0.86	1081	0.98	1143	1.11	1203	1.24	1260	1.37
1700	1032	0.94	1094	1.06	1155	1.19	1213	1.32	1269	1.46
1800	1048	1.02	1109	1.15	1168	1.28	1224	1.42	1279	1.56
1900	1066	1.11	1125	1.24	1182	1.38	1237	1.52	1291	1.66
2000	1084	1.21	1142	1.35	1197	1.49	1251	1.63	1304	1.78
2100	1104	1.31	1160	1.45	1214	1.60	1267	1.75	1318	1.90
2200	1124	1.43	1179	1.57	1231	1.72	1283	1.87	1333	2.03
2300	1145	1.55	1198	1.70	1250	1.85	1300	2.01	1349	2.17
2400	1167	1.68	1219	1.83	1269	1.99	1318	2.15	1366	2.31
2500	1189	1.82	1240	1.97	1290	2.14	1337	2.30	—	—

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 49 – Fan Performance - 48PDF06 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	620	0.30	711	0.39	794	0.49	871	0.59	944	0.70
1600	648	0.35	736	0.45	816	0.55	890	0.65	960	0.76
1700	677	0.40	762	0.51	838	0.61	910	0.72	978	0.84
1800	707	0.47	788	0.58	862	0.69	931	0.80	997	0.92
1900	737	0.54	815	0.65	887	0.77	954	0.89	1017	1.01
2000	767	0.61	843	0.73	912	0.85	977	0.98	1039	1.11
2100	798	0.70	871	0.82	938	0.95	1001	1.08	1061	1.21
2200	829	0.79	900	0.92	965	1.05	1026	1.19	1084	1.33
2300	861	0.89	929	1.03	992	1.17	1052	1.31	1108	1.45
2400	893	1.00	959	1.15	1020	1.29	1078	1.43	1133	1.58
2500	925	1.12	989	1.27	1048	1.42	1105	1.57	1158	1.72

AIRFLOW (CFM)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	1013	0.81	1078	0.92	1141	1.05	1202	1.17	1260	1.30
1600	1027	0.88	1091	1.00	1152	1.13	1211	1.25	1269	1.39
1700	1043	0.96	1105	1.08	1165	1.21	1222	1.35	1278	1.48
1800	1060	1.05	1120	1.18	1179	1.31	1235	1.44	1290	1.59
1900	1078	1.14	1137	1.27	1194	1.41	1249	1.55	1302	1.70
2000	1098	1.24	1155	1.38	1210	1.52	1264	1.67	1316	1.81
2100	1119	1.35	1174	1.49	1228	1.64	1280	1.79	1331	1.94
2200	1140	1.47	1195	1.62	1247	1.77	1298	1.92	1348	2.08
2300	1163	1.60	1216	1.75	1267	1.90	1317	2.06	1365	2.22
2400	1186	1.73	1238	1.89	1288	2.05	1336	2.21	1384	2.37
2500	1210	1.88	1261	2.04	1309	2.20	1357	2.37	—	—

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 50 – Fan Performance - 48PDD05 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	436	0.12	559	0.19	661	0.27	753	0.35	839	0.45
1300	456	0.14	574	0.22	673	0.30	762	0.39	845	0.49
1400	477	0.17	592	0.25	687	0.34	774	0.43	853	0.53
1500	500	0.20	611	0.29	703	0.38	787	0.48	864	0.58
1600	523	0.24	631	0.33	721	0.43	801	0.53	877	0.63
1700	548	0.28	652	0.38	739	0.48	818	0.58	891	0.69
1800	573	0.32	674	0.43	759	0.54	835	0.64	906	0.76
1900	600	0.37	697	0.48	779	0.60	854	0.71	923	0.83
2000	627	0.43	720	0.55	801	0.67	873	0.79	941	0.91

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	918	0.54	993	0.64	1063	0.75	1130	0.86	1193	0.97
1300	922	0.58	995	0.69	1064	0.80	1130	0.91	1193	1.03
1400	929	0.63	1000	0.74	1067	0.85	1132	0.97	1194	1.09
1500	937	0.69	1006	0.80	1072	0.91	1136	1.03	1196	1.16
1600	947	0.74	1015	0.86	1079	0.98	1141	1.10	1201	1.23
1700	959	0.81	1025	0.93	1088	1.05	1148	1.18	1207	1.31
1800	973	0.88	1037	1.00	1098	1.13	1157	1.26	1214	1.39
1900	988	0.95	1050	1.08	1110	1.21	1168	1.35	1223	1.48
2000	1004	1.04	1065	1.17	1123	1.30	1179	1.44	1234	1.58

LEGEND

Bhp - Brake Horsepower

High-Range Motor/Drive Required

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 51 – Fan Performance - 48PDE05 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	443	0.12	564	0.20	666	0.27	758	0.36	842	0.45
1300	463	0.15	580	0.22	678	0.31	767	0.40	849	0.49
1400	485	0.17	598	0.26	693	0.34	778	0.44	858	0.54
1500	508	0.21	617	0.30	709	0.39	792	0.48	869	0.59
1600	532	0.24	638	0.34	727	0.43	807	0.54	882	0.64
1700	558	0.28	660	0.39	746	0.49	824	0.59	896	0.70
1800	584	0.33	682	0.44	766	0.55	842	0.66	912	0.77
1900	611	0.38	706	0.50	788	0.61	861	0.72	930	0.84
2000	639	0.44	731	0.56	810	0.68	882	0.80	948	0.92

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	922	0.55	996	0.65	1066	0.75	1133	0.86	1196	0.97
1300	926	0.59	999	0.69	1068	0.80	1133	0.92	1196	1.03
1400	933	0.64	1004	0.75	1071	0.86	1136	0.98	1197	1.10
1500	942	0.69	1011	0.80	1077	0.92	1140	1.04	1200	1.17
1600	952	0.75	1020	0.87	1084	0.99	1146	1.11	1205	1.24
1700	965	0.82	1030	0.94	1093	1.06	1153	1.19	1211	1.32
1800	979	0.89	1043	1.01	1104	1.14	1163	1.27	1220	1.41
1900	995	0.97	1057	1.09	1116	1.22	1174	1.36	1229	1.50
2000	1012	1.05	1072	1.18	1130	1.32	1186	1.46	1240	1.60

LEGEND

Bhp - Brake Horsepower

High-Range Motor/Drive Required

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 52 – Fan Performance - 48PDF05 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	456	0.13	574	0.20	675	0.28	766	0.37	850	0.46
1300	477	0.16	591	0.23	688	0.32	776	0.41	857	0.50
1400	500	0.18	610	0.27	703	0.36	788	0.45	867	0.55
1500	524	0.22	630	0.31	720	0.40	802	0.50	879	0.60
1600	550	0.26	652	0.35	739	0.45	819	0.55	893	0.66
1700	576	0.30	675	0.40	759	0.50	836	0.61	908	0.72
1800	604	0.35	699	0.46	781	0.57	856	0.68	925	0.79
1900	633	0.41	724	0.52	804	0.63	876	0.75	944	0.87
2000	662	0.47	750	0.59	828	0.71	898	0.83	964	0.95

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	929	0.56	1003	0.66	1073	0.76	1139	0.87	1202	0.98
1300	934	0.60	1006	0.71	1075	0.82	1140	0.93	1202	1.05
1400	941	0.65	1012	0.76	1079	0.87	1143	0.99	1204	1.11
1500	951	0.71	1020	0.82	1085	0.94	1148	1.06	1208	1.18
1600	963	0.77	1029	0.89	1093	1.01	1155	1.13	1214	1.26
1700	976	0.84	1041	0.96	1103	1.08	1163	1.21	1221	1.34
1800	991	0.91	1054	1.04	1115	1.16	1174	1.30	1230	1.43
1900	1008	0.99	1070	1.12	1129	1.25	1186	1.39	1241	1.53
2000	1026	1.08	1086	1.21	1144	1.35	1199	1.49	1253	1.63

LEGEND

Bhp - Brake Horsepower

High Range Motor/Drive Required

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 53 – Fan Performance - 48PDD06 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	521	0.22	628	0.31	718	0.40	800	0.49	877	0.60
1600	546	0.25	649	0.35	737	0.45	816	0.55	890	0.65
1700	572	0.30	671	0.40	757	0.50	834	0.61	906	0.72
1800	599	0.35	695	0.45	777	0.56	852	0.67	922	0.79
1900	627	0.40	719	0.51	799	0.63	872	0.74	940	0.86
2000	655	0.46	745	0.58	822	0.70	893	0.82	959	0.94
2100	684	0.53	771	0.66	846	0.78	915	0.91	979	1.03
2200	714	0.61	797	0.74	871	0.87	938	1.00	1001	1.13
2300	744	0.69	824	0.83	896	0.96	961	1.10	1022	1.24
2400	775	0.78	852	0.92	922	1.06	985	1.21	1045	1.35
2500	806	0.88	880	1.03	948	1.18	1010	1.32	1069	1.47

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	949	0.70	1018	0.82	1083	0.93	1146	1.05	1207	1.18
1600	961	0.77	1027	0.88	1091	1.00	1153	1.13	1212	1.26
1700	974	0.83	1039	0.95	1101	1.08	1161	1.21	1219	1.34
1800	988	0.91	1052	1.03	1112	1.16	1171	1.29	1227	1.43
1900	1004	0.99	1066	1.11	1125	1.25	1182	1.38	1238	1.52
2000	1022	1.07	1082	1.20	1139	1.34	1195	1.48	1249	1.62
2100	1040	1.17	1099	1.30	1155	1.44	1209	1.59	1262	1.73
2200	1060	1.27	1117	1.41	1172	1.55	1225	1.70	1277	1.85
2300	1081	1.38	1136	1.52	1190	1.67	1242	1.82	1292	1.98
2400	1102	1.50	1156	1.65	1209	1.80	1259	1.96	1309	2.12
2500	1124	1.62	1177	1.78	1228	1.94	1278	2.10	1326	2.26

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 54 – Fan Performance - 48PDE06 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	536	0.23	640	0.32	729	0.41	811	0.51	887	0.61
1600	563	0.27	663	0.36	749	0.46	828	0.56	901	0.67
1700	590	0.31	686	0.42	770	0.52	846	0.62	917	0.74
1800	619	0.37	711	0.47	792	0.58	866	0.69	935	0.81
1900	648	0.43	737	0.54	816	0.65	887	0.77	954	0.89
2000	678	0.49	764	0.61	840	0.73	909	0.85	975	0.98
2100	709	0.56	792	0.69	865	0.81	933	0.94	996	1.07
2200	740	0.65	820	0.78	891	0.91	957	1.04	1019	1.17
2300	772	0.73	849	0.87	918	1.01	982	1.14	1042	1.28
2400	804	0.83	879	0.97	946	1.12	1008	1.26	1066	1.40
2500	837	0.94	909	1.09	974	1.24	1034	1.38	1092	1.53

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	958	0.72	1027	0.83	1092	0.95	1154	1.07	1214	1.20
1600	971	0.78	1037	0.90	1101	1.02	1162	1.15	1221	1.28
1700	985	0.85	1049	0.97	1111	1.10	1171	1.23	1228	1.36
1800	1001	0.93	1063	1.05	1124	1.18	1182	1.32	1238	1.45
1900	1018	1.01	1079	1.14	1138	1.27	1194	1.41	1249	1.55
2000	1036	1.10	1096	1.24	1153	1.37	1208	1.51	1262	1.66
2100	1056	1.20	1114	1.34	1170	1.48	1224	1.63	1276	1.78
2200	1077	1.31	1134	1.45	1188	1.60	1241	1.75	1292	1.90
2300	1099	1.43	1154	1.57	1207	1.72	1259	1.88	1309	2.03
2400	1122	1.55	1176	1.70	1228	1.86	1278	2.02	1327	2.18
2500	1146	1.69	1198	1.84	1249	2.00	1298	2.16	1346	2.33

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 55 – Fan Performance - 48PDF06 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	551	0.24	653	0.33	741	0.42	821	0.52	896	0.62
1600	579	0.28	676	0.38	761	0.48	839	0.58	912	0.69
1700	608	0.33	701	0.43	783	0.54	858	0.64	929	0.76
1800	638	0.39	727	0.49	807	0.60	879	0.71	948	0.83
1900	668	0.45	755	0.56	831	0.68	902	0.79	968	0.91
2000	700	0.52	783	0.64	857	0.76	925	0.88	990	1.01
2100	732	0.60	812	0.72	884	0.85	950	0.97	1013	1.11
2200	765	0.68	842	0.81	912	0.95	976	1.08	1037	1.21
2300	799	0.78	873	0.92	940	1.05	1002	1.19	1062	1.33
2400	833	0.88	904	1.03	969	1.17	1030	1.31	1087	1.46
2500	867	1.00	936	1.15	999	1.30	1058	1.44	1114	1.60

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	968	0.73	1035	0.85	1100	0.97	1162	1.09	1222	1.21
1600	981	0.80	1047	0.92	1110	1.04	1171	1.16	1229	1.29
1700	996	0.87	1060	0.99	1121	1.12	1181	1.25	1238	1.38
1800	1013	0.95	1075	1.08	1135	1.21	1193	1.34	1248	1.48
1900	1031	1.04	1092	1.17	1150	1.30	1206	1.44	1261	1.58
2000	1051	1.14	1110	1.27	1166	1.41	1221	1.55	1275	1.69
2100	1072	1.24	1129	1.38	1185	1.52	1238	1.67	1290	1.82
2200	1094	1.35	1150	1.50	1204	1.64	1256	1.79	1307	1.95
2300	1118	1.48	1172	1.62	1225	1.77	1275	1.93	1325	2.09
2400	1142	1.61	1195	1.76	1246	1.92	1296	2.07	1344	2.24
2500	1168	1.75	1219	1.91	1269	2.07	1317	2.23	1365	2.40

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 56 – Fan Performance - 50PD05 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	492	0.15	604	0.22	701	0.31	790	0.39	873	0.49
1300	513	0.18	620	0.26	714	0.34	800	0.43	880	0.53
1400	534	0.21	638	0.29	729	0.38	812	0.48	889	0.58
1500	557	0.24	657	0.33	745	0.43	825	0.53	900	0.63
1600	580	0.28	677	0.38	762	0.48	839	0.58	912	0.69
1700	603	0.33	697	0.43	779	0.53	855	0.64	926	0.75
1800	627	0.38	718	0.48	798	0.59	871	0.70	940	0.82
1900	651	0.43	739	0.54	817	0.65	889	0.77	956	0.89
2000	675	0.49	761	0.61	837	0.72	907	0.85	972	0.97

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	950	0.58	1023	0.69	1092	0.79	1157	0.90	1219	1.02
1300	955	0.63	1027	0.74	1094	0.85	1158	0.96	1220	1.08
1400	962	0.68	1032	0.79	1098	0.91	1161	1.03	1222	1.15
1500	971	0.74	1039	0.85	1103	0.97	1165	1.09	1225	1.22
1600	981	0.80	1047	0.92	1110	1.04	1171	1.17	1229	1.30
1700	993	0.87	1057	0.99	1118	1.11	1178	1.24	1235	1.38
1800	1005	0.94	1068	1.06	1128	1.19	1186	1.33	1242	1.46
1900	1019	1.02	1080	1.14	1139	1.28	1196	1.41	1251	1.56
2000	1034	1.10	1094	1.23	1151	1.37	1206	1.51	1260	1.65

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 57 – Fan Performance - 50PD06 Vertical Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	568	0.25	667	0.34	753	0.44	833	0.54	908	0.64
1600	592	0.29	687	0.39	771	0.49	848	0.59	920	0.70
1700	616	0.34	708	0.44	789	0.54	864	0.65	934	0.76
1800	641	0.39	730	0.50	809	0.61	881	0.72	950	0.83
1900	665	0.45	752	0.56	829	0.67	900	0.79	966	0.91
2000	690	0.51	775	0.63	850	0.75	918	0.87	983	0.99
2100	716	0.57	798	0.70	871	0.82	938	0.95	1001	1.08
2200	742	0.65	821	0.78	892	0.91	958	1.04	1020	1.18
2300	768	0.73	845	0.86	915	1.00	979	1.14	1039	1.28
2400	794	0.81	869	0.96	937	1.10	1000	1.24	1059	1.38
2500	820	0.91	894	1.05	960	1.20	1021	1.35	1079	1.50

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	978	0.75	1046	0.87	1110	0.98	1172	1.11	1231	1.23
1600	989	0.81	1055	0.93	1117	1.05	1178	1.18	1236	1.31
1700	1001	0.88	1065	1.00	1126	1.13	1185	1.26	1242	1.39
1800	1015	0.96	1077	1.08	1136	1.21	1194	1.35	1250	1.48
1900	1029	1.04	1090	1.16	1148	1.30	1204	1.44	1259	1.58
2000	1045	1.12	1104	1.26	1161	1.39	1216	1.53	1269	1.68
2100	1061	1.21	1119	1.35	1174	1.49	1228	1.64	1280	1.79
2200	1078	1.31	1135	1.45	1189	1.60	1241	1.75	1293	1.90
2300	1096	1.42	1151	1.57	1204	1.71	1256	1.87	1306	2.02
2400	1115	1.53	1169	1.68	1221	1.84	1271	1.99	1320	2.15
2500	1134	1.65	1187	1.81	1238	1.97	1287	2.13	1335	2.29

LEGEND

Bhp - Brake Horsepower

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 58 – Fan Performance - 50PD05 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	422	0.11	548	0.19	652	0.26	745	0.35	831	0.44
1300	439	0.13	561	0.21	662	0.29	752	0.38	835	0.47
1400	457	0.16	577	0.24	674	0.33	761	0.42	842	0.51
1500	477	0.19	593	0.27	688	0.37	773	0.46	851	0.56
1600	498	0.22	611	0.31	704	0.41	786	0.51	862	0.61
1700	521	0.25	630	0.35	720	0.46	801	0.56	875	0.67
1800	545	0.29	650	0.40	738	0.51	817	0.62	889	0.73
1900	569	0.34	672	0.45	757	0.57	834	0.68	904	0.80
2000	595	0.39	694	0.51	777	0.63	852	0.75	921	0.87

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1200	911	0.53	□ 986	0.63	1056	0.74	1123	0.85	1187	0.96
1300	913	0.57	□ 986	0.68	1056	0.78	1122	0.90	1185	1.01
1400	918	0.62	□ 989	0.72	1058	0.84	1123	0.95	1185	1.07
1500	925	0.67	□ 995	0.78	1061	0.89	1125	1.01	1186	1.14
1600	934	0.72	1002	0.84	1067	0.95	1129	1.08	1189	1.21
1700	944	0.78	1010	0.90	1074	1.02	1135	1.15	1194	1.28
1800	956	0.85	1021	0.97	1083	1.09	1143	1.23	1200	1.36
1900	970	0.92	1033	1.04	1094	1.17	1152	1.31	1208	1.45
2000	985	1.00	1047	1.13	1106	1.26	1162	1.40	1217	1.54

LEGEND

Bhp – Brake Horsepower

High Range Motor/Drive Required

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

Table 59 – Fan Performance – 50PD06 Horizontal Units

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	491	0.19	604	0.28	697	0.37	781	0.47	859	0.57
1600	513	0.23	623	0.32	714	0.42	795	0.52	871	0.62
1700	537	0.27	643	0.37	731	0.47	810	0.57	884	0.68
1800	561	0.31	664	0.42	750	0.52	827	0.63	899	0.75
1900	586	0.36	686	0.47	770	0.58	845	0.70	915	0.82
2000	613	0.41	709	0.53	790	0.65	864	0.77	932	0.89
2100	640	0.47	732	0.60	812	0.72	884	0.85	950	0.97
2200	667	0.54	757	0.67	834	0.80	904	0.93	969	1.06
2300	695	0.61	782	0.75	857	0.89	926	1.02	989	1.16
2400	724	0.69	807	0.84	881	0.98	948	1.12	1010	1.26
2500	753	0.78	833	0.93	905	1.08	971	1.23	1032	1.38

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
1500	932	0.68	1002	0.79	1068	0.91	1132	1.03	1192	1.15
1600	942	0.73	1009	0.85	1074	0.97	1136	1.09	1196	1.22
1700	953	0.80	1019	0.91	1082	1.04	1143	1.17	1201	1.30
1800	966	0.86	1030	0.99	1092	1.11	1151	1.24	1208	1.38
1900	980	0.94	1043	1.06	1103	1.19	1161	1.33	1217	1.47
2000	996	1.02	1057	1.15	1115	1.28	1172	1.42	1227	1.56
2100	1012	1.11	1072	1.24	1129	1.38	1184	1.52	1238	1.67
2200	1030	1.20	1088	1.34	1144	1.48	1198	1.63	1251	1.78
2300	1049	1.30	1106	1.44	1160	1.59	1213	1.74	1265	1.89
2400	1068	1.41	1124	1.56	1178	1.71	1229	1.86	1279	2.02
2500	1089	1.53	1143	1.68	1196	1.84	1246	1.99	1295	2.16

LEGEND

Bhp – Brake Horsepower

Low Range Motor/Drive Required

NOTES:

1. Maximum continuous BHP is 2.0.
2. See General Fan Performance Notes.

GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Static pressure losses from accessories and options (economizer, etc.) must be added to external static pressure before entering Fan Performance table. Refer to Accessory/FIOP Static Pressure information.
2. Interpolation is permissible. Do not extrapolate.
3. Fan performance tables are based on wet coils, clean filters, and casing losses. Gas heat losses are included for 48 series units.
4. Extensive motor and drive testing on these units ensures that the full horsepower range of the motor can be utilized with confidence. Using the fan motors up to the bhp rating shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Use of a field-supplied motor may affect wire size. Recalculate the unit power supply MCA and MOCP if required. Contact your Carrier representative for details.
6. Use the following formula to calculate input watts:
   Input Watts = Bhp x (746/Motor Eff)

APPENDIX D - ADDITIONAL START-UP DATA

Table 60 – Air Quantity Limits (50PD Units)

UNIT 50PD	COOLING (cfm)		HEATING (cfm) OPTIONAL ELECTRIC HEAT	
05	1200	2000	1200	2000
06	1500	2500	1500	2500

Table 61 – Air Quantity Limits (48PD Units)

UNIT 48PD	COOLING (cfm)		HEATING (cfm)	
	Min	Max	Min	Max
05 (Low Heat)	1200	2000	600	1680
05 (Med Heat)	1200	2000	940	2810
05 (High Heat)	1200	2000	1130	2820
06 (Low Heat)	1500	2500	940	2810
06 (Med Heat)	1500	2500	1130	2820
06 (High Heat)	1500	2500	1510	2520

Table 62 – Evaporator Fan Motor Specifications - 48/50PD

48/50PD	DRIVE	VOLTAGE/PHASE	EFFICIENCY	MAX BHP	MAX AMPS
05 & 06	Low & High	208/230–3ph	0.80	2.0	6.4
		460–3ph	0.80	2.0	3.2

NOTES:

1. Extensive motor and electrical testing ensures that the motors can be utilized with confidence up to the maximum applied bhp, watts, and amps. Using the fan motor up to the maximum ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. Convert bhp to watts using the following formula:

$$\text{watts} = \frac{\text{bhp (746)}}{\text{motor efficiency}}$$

3. The EPACT (Energy Policy Act of 1992) regulates energy requirements for specific types of indoor-fan motors. Motors regulated by EPACT include any general purpose, T-frame (three-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT-compliant energy-efficient motor. Variable-speed motors are exempt from EPACT compliance requirements. Therefore, the indoor-fan motors for Carrier 48/50PG03-14 units are exempt from these requirements.

Table 63 – Fan Rpm at Motor Pulley Settings* - 48/50PD

UNIT 48/50PD	DRIVE	MOTOR PULLEY TURNS OPEN										
		0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
05	Low	910	878	847	815	784	753	721	690	659	627	596
	High	1173	1139	1104	1070	1035	1001	966	932	897	863	828
06	Low	978	949	920	891	863	834	805	776	748	719	690
	High	1261	1227	1194	1161	1128	1095	1062	1028	995	962	929

*Approximate fan rpm shown, based on 1725 rpm motor.
NOTE: Factory speed setting is at 5 turns open.

Table 64 – Accessory/FIOP Pressure Drop (in. wg) - 48/50PD

AIRFLOW (CFM)	ELECTRIC HEAT	ECONOMIZER (Vertical)	ECONOMIZER (Horizontal)
600	0.01	0.01	0.03
800	0.01	0.01	0.05
1000	0.02	0.02	0.07
1200	0.02	0.03	0.10
1400	0.03	0.04	0.14
1600	0.04	0.06	0.17
1800	0.05	0.07	0.22
2000	0.07	0.09	0.26
2200	0.08	0.11	0.31
2400	0.10	0.13	0.37
2600	0.11	0.15	0.43
2800	0.13	0.18	0.49
3000	0.15	0.21	0.56

CONTROL SET POINT AND CONFIGURATION LOG

Model Number: _____ Software Versions: _____

Serial Number: _____ MBB: CESR131320-- _ _

Date: _____ ECB: CESR131249-- _ _

Technician: _____ MARQ: CESR131171-- _ _

INDICATE UNIT SETTINGS BELOW

Control Type: Thermostat/T55 Space Temp./T-56 Space Temp./T-58 Space Temp.

Set Points: Cooling Occupied: _____ Unoccupied: _____

Heating Occupied: _____ Unoccupied: _____

Table 65 – MODE - CONFIGURATION

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB–TABLE	CCN POINT	ENTRY
CONFIGURATION					SERVICE CONFIGURATION		
DISP	Display Configuration				DISPLAY		
METR	Metric Display	On/Off		Off		DISPUNIT	
LANG	Language Selection	0=English 1=Spanish 2=French 3=Portuguese		0		LANGUAGE	
PROT	Password Enable	Enable/Disable		Disable		PASS_EBL	
PSWD	Service Password	0000 to 9999		1111		PASSWORD	
TEST	Test Display LEDs	On/Off		Off	(display only, not in table)	DISPTEST	
UNIT	Unit Configuration				UNIT		
S.DLY	Startup Delay	0 to 600	sec	30		STARTDLY	
OC.FN	Fan On When Occupied	Yes/No		Yes		OCC_FAN	
IDF.F	Shut Down on IDF Failure	Yes/No		Yes		FATALFAN	
FS.MX	Supply Fan Maximum Speed	80 to 100	%	100		SPEEDMAX	
FS.MN	Supply Fan Minimum Speed	10 to 70	%	70		SPEEDMIN	
FS.VM	Vent Mode Fan Speed	10 to 100	%	50		SPEEDVNT	
FN.SW	Fan Status Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		FANSTCFG	
FL.SW	Filter Status Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		FILSTCFG	
FS.SW	Fire Shutdown Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		SHTDNCFG	
RM.SW	Remote Occupancy Switch	0=No Switch 1=Normal Open 2=Normal Closed		0		REMOCCFG	
RH.S	RH Sensor on OAQ Input	Yes/No		No		RH_OAQ	
RH.SW	Space Humidity Switch	0=No Switch 1=Normal Open 2=Normal Closed		0		HUMSTCFG	
TCS.C	Temp Cmp Strt Cool Factr	0 to 60	mins	0		TCSTCOOL	
TCS.H	Temp Cmp Strt Heat Factr	0 to 60	mins	0		TCSTHEAT	
COOL	Cooling Configuration				COOL_CFG		
MIN.C	Min Compressor Capacity	15 to 80	%	70		MIN_CAPC	
FS.CD	Fan Speed Control Demand	1 to 9.9	^F	3		SPEEDDMD	
MRT.C	Compressor Min On Time	120 to 999	sec	180		MIN_ON	
MOT.C	Compressor Min Off Time	300 to 999	sec	300		MIN_OFF	
RST.C	Runtime to Reset Strikes	120 to 999	sec	300		MIN_ON_S	
FOD.C	Fan–off Delay, Mech Cool	0 to 600	sec	60		COOL_FOD	
CS.A1	Current Sensing A1	Enable/Disable		Disable: reserved for future use DO NOT ENABLE		A1_SENSE	
C.LO	Compressor Lockout Temp	0 to 100F	dF	0		OATLCOMP	
ALM.N	Alert Each Strike	Yes//No		Yes		ALM_NOW	
SAT	Supply Air Temperature						
SASP	Cool Supply Air Setpoint	45 to 75	dF	65		SASP	
SA.MU	SASP Maximum Reset Up	0 to 20	^F	10		SASPMAXU	
SA.MD	SASP Maximum Reset Down	–20 to 0	^F	–10		SASPMAXD	
SST	Low Suction Control						
SST.O	Suction OK Temperature	10 to 50	dF	18		SSTOK	
SST.1	Low Suction – Level 1	10 to 50	dF	20		SSTLEV1	
SST.2	Low Suction – Level 2	5 to 50	dF	15		SSTLEV2	
SST.3	Low Suction – Level 3	0 to 50	dF	10		SSTLEV3	
PSI.D	Ckt A Minimum Pressure	0 to 500	psig	20		DELTAP_A	
OFC	Outdoor Fan Control						
1.MXP	Fan Lev1 Max Pressure	100 to 500	psig	450		LEV1MAXP	
2.MNP	Fan Lev2 Min Pressure	100 to 500	psig	200		LEV2MINP	
2.ON	Fan Lev2 On Temperature	0 to 100	F	55		LEV2ON	
2.OFF	Fan Lev2 Off Temperature	0 to 100	F	45		LEV2OFF	

Table 65 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB−TABLE	CCN POINT	ENTRY
HEAT	Heating Configuration				HEAT_CFG		
HT.TY	Type of Heat Installed	0=No Heat 1=Gas 2=Electric		0 (50 series with no electric heat) 1 (48 series) 2 (50 series with electric heat)		HEATTYPE	
N.HTR	Number of Heat Stages	1 to 2		1 (50 series <15kW) 2 (48 series, 50 series >=15kW)		NUM_HEAT	
MRT.H	Heat Minimum On Time	60 to 999	sec	120		HMIN_ON	
MOT.H	Heat Minimum Off Time	60 to 999	sec	120		HMIN_OFF	
H.DEC	Heat Stage Decrease Time	120 to 999	sec	300		HSTAGDEC	
H.INC	Heat Stage Increase Time	120 to 999	sec	450		HSTAGINC	
FOD.E	Fan−off Delay, Elect Heat	10 to 600	sec	30		ELEC_FOD	
FOD.G	Fan−off Delay, Gas Heat	45 to 600	sec	45		GAS_FOD	
HT.LO	Heating Lockout Temp	40 to 125F	dF	75		OATLHEAT	
SAT	SUPPLY AIR TEMPERATURE						
SAT.H	SAT Heat Mode Sensing	Enable/Disable		Disable		SAT_HEAT	
SAM.L	Maximum SAT Lower Level	85 to 200	dF	140		SATMAX_L	
SAM.U	Maximum SAT Upper Level	85 to 200	dF	160		SATMAX_H	
SPT	SPACE TEMPERATURE						
HT.PD	SPT Heat Demand (+) Level	0.5 to 5	^F	1		HDEM_POS	
HT.ND	SPT Heat Demand (−) Level	−5 to −0.5	^F	−1		HDEM_NEG	
H.LAG	Heat Thermal Lag Factor	0 to 5	min	1		HEAT_LAG	
ECON	Economizer Configuration				ECON_CFG		
EC.EN	Economizer Installed	Yes/No		No: no FIOP Yes: FIOP		ECONO	
E.CTL	Economizer Control Type	1=Dig/Position 2=Dig/Command 3=Analog Ctrl		1		ECON_CTL	
MP.25	Econ Min at 25% Fanspeed	0 to 100	%	0		MINP_25	
MP.50	Econ Min at 50% Fanspeed	0 to 100	%	0		MINP_50	
MP.75	Econ Min at 75% Fanspeed	0 to 100	%	0		MINP_75	
MP.MX	Econ Min at Max Fanspeed	0 to 100	%	30		MINP_MAX	
EC.MX	Econo Cool Max Position	0 to 100	%	100		ECONOMAX	
M.ANG	Min Actuator Ctrl Angle	75 to 90		88		MINANGLE	
EH.LO	Econo Cool Hi Temp Limit	40 to 100F	dF	65		OATLECLH	
EL.LO	Econo Cool Lo Temp Limit	−30 to 50F	dF	0		OATLECLL	
DF.DB	Diff Dry Bulb Control	Disable/Enable		Enable		DIFFBULB	
UEFC	Unoccupied Free Cooling	0=Disabled 1=Unoccupied 2=Preoccupancy		2		UEFC_CFG	
FC.TM	Free Cool PreOcc Time	1 to 9999	min	120		UEFCTIME	
FC.LO	Free Cool Low Temp Limit	−30 to 70F	dF	50		OATLUEFC	
PE.EN	Power Exhaust Installed	Yes/No		No: no FIOP Yes: FIOP		PE_ENABL	
PE1.C	Power Exhaust Stage1 CFM	100 to 15000	cfm	600		PE1_CFM	
PE2.C	Power Exhaust Stage2 CFM	100 to 15000	cfm	0		PE2_CFM	
IDF.C	Indoor Fan Max Speed CFM	500 to 15000	cfm	1600 (05) 2000 (06)		IDF_CFM	
EN.SW	Enthalpy Switch	0=No Switch 1=Normal Open 2=Normal Closed		0: no FIOP 1: FIOP		ENTHLCFG	

Table 65 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB−TABLE	CCN POINT	ENTRY
AIR.Q	Air Quality Config.				IAQ_CFG		
IA.CF	IAQ Analog Input Config	0=No IAQ 1=DCV 2=Override IAQ 3=Ctrl Min Pos		0: no FIOP 1: FIOP		IAQANCFG	
IA.FN	IAQ Analog Fan Config	0=Never 1=Occupied 2=Always		0		IAQANFAN	
II.CF	IAQ Switch Input Config	0=No IAQ 1=DCV N/O 2=DCV N/C 3=Override N/O 4=Override N/C		0		IAQINCFG	
II.FN	IAQ Switch Fan Config	0=Never 1=Occupied 2=Always		0		IAQINFAN	
AQ.MN	Econo Min IAQ Position	0 to 100	%	10		IAQMINP	
OVR.P	IAQ Override Position	0 to 100	%	100		IAQOVPOS	
OA.CF	OAQ Analog Input Config	0=No OAQ 1=DCV 2=Lockout OAQ		0		OAQANCFG	
OAQ.L	OAQ Lockout Limit	0 to 5000		600		OAQLOCK	
AQD.L	AQ Differential Low	0 to 5000		100		DAQ_LOW	
AQD.H	AQ Differential High	0 to 5000		700		DAQ_HIGH	
DF.ON	Fan On AQ Differential	0 to 5000		600		DAQFNON	
DF.OF	Fan Off AQ Differential	0 to 5000		200		DAQFNOFF	
I.4M	IAQ Sensor Value at 4mA	0 to 5000		0		IAQ_4MA	
I.20M	IAQ Sensor Value at 20mA	0 to 5000		2000		IAQ_20MA	
O.4M	OAQ Sensor Value at 4mA	0 to 5000		0		OAQ_4MA	
O.20M	OAQ Sensor Value at 20mA	0 to 5000		2000		OAQ_20MA	
H.4M	RH Sensor Value at 4mA	0 to 50	%	0		RH_4MA	
H.20M	RH Sensor Value at 20mA	60 to 100	%	100		RH_20MA	
ALM.O	Alarm Relay Config.				ALM_CFG		
A.SPC	SPT/SPRH Sensor Failure	Yes/No		Yes		SPACE_AL	
A.SRT	SAT/RAT Sensor Failure	Yes/No		Yes		SATRATAL	
A.OAT	OAT Thermistor Failure	Yes/No		Yes		OAT_AL	
A.CS	Current Sensor Failure	Yes/No		No		CS_AL	
A.CMP	Compressor Failure	Yes/No		Yes		COMP_AL	
A.CKT	Refrig Circuit Failure	Yes/No		Yes		CKT_AL	
A.SSP	SSP Transducer Failure	Yes/No		Yes		SSP_AL	
A.SCT	SCT Thermistor Failure	Yes/No		Yes		SCT_AL	
A.FAN	Indoor Fan Failure	Yes/No		Yes		FAN_AL	
A.FIL	Dirty Filter	Yes/No		Yes		FILT_AL	
A.ECO	Economizer Failure	Yes/No		Yes		ECON_AL	
PID	PID Configurations				PID_CFG		
EC.P	Economizer PID − kP	0.0 to 99.9		2.5		ECONO_P	
EC.I	Economizer PID − kI	0.0 to 99.9		0.1		ECONO_I	
EC.D	Economizer PID − kD	0.0 to 99.9		1		ECONO_D	
EC.DT	Economizer PID − rate	10.0 to 180.0	sec	15		ECONO_DT	
E.DBD	Economizer PID Deadband	0 to 25	%	3		ECONBAND	
CP.P	Capacity PID − kP	0 to 99.9		1.5		VCAP_P	
CP.I	Capacity PID − kI	0 to 99.9		0.1		VCAP_I	
CP.D	Capacity PID − kD	0 to 99.9		1		VCAP_D	
CP.DT	Capacity PID − rate	1 to 30	secs	5		VCAP_DT	
LK.P	Linkage Staging PID − kP	0.0 to 99.9		10		LINK_P	
LK.I	Linkage Staging PID − kI	0.0 to 99.9		5		LINK_I	
LK.D	Linkage Staging PID − kD	0.0 to 99.9		5		LINK_D	
LK.DT	Linkage Staging PID − rate	10.0 to 180.0	secs	30		LINK_DT	

Table 65 — MODE - CONFIGURATION (cont)

ITEM	EXPANSION	RANGE	UNITS	DEFAULT	CCN TABLE/SUB−TABLE	CCN POINT	ENTRY
(GENERIC = CCN only)					GENERICS		
	POINT 01 Definition	8−char ASCII				Point_01	
	POINT 02 Definition	8−char ASCII				Point_02	
	POINT 03 Definition	8−char ASCII				Point_03	
	POINT 04 Definition	8−char ASCII				Point_04	
	POINT 05 Definition	8−char ASCII				Point_05	
	POINT 06 Definition	8−char ASCII				Point_06	
	POINT 07 Definition	8−char ASCII				Point_07	
	POINT 08 Definition	8−char ASCII				Point_08	
	POINT 09 Definition	8−char ASCII				Point_09	
	POINT 10 Definition	8−char ASCII				Point_10	
	POINT 11 Definition	8−char ASCII				Point_11	
	POINT 12 Definition	8−char ASCII				Point_12	
	POINT 13 Definition	8−char ASCII				Point_13	
	POINT 14 Definition	8−char ASCII				Point_14	
	POINT 15 Definition	8−char ASCII				Point_15	
	POINT 16 Definition	8−char ASCII				Point_16	
	POINT 17 Definition	8−char ASCII				Point_17	
	POINT 18 Definition	8−char ASCII				Point_18	
	POINT 19 Definition	8−char ASCII				Point_19	
	POINT 20 Definition	8−char ASCII				Point_20	
TRIM	Sensor Calibration				(CCN TRIM − see Maintenance Display)		
SPT.C	Space Temp Calibration	−30 to 130	dF				
SPT.T	Space Temp Trim	−30 to 30	^F	0			
SAT.C	Supply Air Temp Calib.	−30 to 130	dF				
SAT.T	Supply Air Temp Trim	−30 to 30	^F	0			
RAT.C	Return Air Temp Calib.	−30 to 130	dF				
RAT.T	Return Air Temp Trim	−30 to 30	^F	0			
CCN	CCN Configuration				CONFIGURATION 48_50_PD		
CCN.A	CCN Element Number	1 to 239		1		CCNADD	
CCN.B	CCN Bus Number	0 to 239		0		CCNBUS	
BAUD	CCN Baud Rate	2400, 4800, 9600, 19200, 38400		3		CCNBAUDD	
BROD	CCN Broadcast Config.				BRODEFS		
B.TIM	CCN Time/Date Broadcast	Yes/No		No		CCNBC	
B.OAT	CCN OAT Broadcast	Yes/No		No		OATBC	
B.GS	Global Schedule Broadcst	Yes/No		No		GSBC	
B.ACK	CCN Broadcast Ack'er	Yes/No		No		CCNBCACK	
SCH.O	CCN Schedule Overrides				SCHEDOVR		
SCH.N	Schedule Number	0 = Always Occupied 1−64 = Local Schedule 65−99 = Global Schedule		0		SCHEDNUM	
HOL.G	Accept Global Holidays	Yes/No		No		HOLIDAYT	
OV.TL	Override Time Limit	0 to 4	hours	4		OTL	
OV.EX	Timed Override Hours	0 to 4	hours	0		OVR_EXT	
OV.SP	SPT Override Enabled	Yes/No		Yes		TIMEOVER	
LDSH	CCN Schedule Overrides				LOADSHED		
S.GRP	Loadshed Group Number	0 to 16		0		SHED_NUM	
R.MXC	Redline Max Capacity	0 to 100	%	100		MAXCREDL	
S.MXC	Loadshed Max Capacity	0 to 100	%	100		MAXCSHED	
R.MXH	Redline Max Heat Stages	0 to 2		2		MAXHREDL	
S.MXH	Loadshed Max Heat Stages	0 to 2		2		MAXHSHED	

UNIT START-UP CHECKLIST

MODEL NO.:_____ SERIAL NO: _____

DATE:_____ TECHNICIAN: _____

I. PRE-START-UP:

☐ VERIFY THAT ALL PACKAGING MATERIALS HAVE BEEN REMOVED FROM UNIT
☐ VERIFY INSTALLATION OF OUTDOOR AIR HOOD
☐ VERIFY INSTALLATION OF FLUE EXHAUST AND INLET HOOD (48PD ONLY)
☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS
☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
☐ VERIFY GAS PRESSURE TO UNIT GAS VALVE IS WITHIN SPECIFIED RANGE (48PD ONLY)
☐ CHECK GAS PIPING FOR LEAKS (48PD ONLY)
☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
☐ VERIFY THAT UNIT IS LEVEL
☐ CHECK FAN WHEELS AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND VERIFY SETSCREW IS TIGHT
☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
☐ VERIFY THAT SCROLL COMPRESSORS ARE ROTATING IN THE CORRECT DIRECTION
☐ VERIFY INSTALLATION OF SPACE SENSOR
☐ VERIFY CONFIGURATION VALUES FOR ELECTRONIC CONTROLS (REFER TO CONTROL SET UP CHECKLIST)
☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR AT LEAST 24 HOURS
☐ VERIFY THAT THE VFD IS IN AUTO MODE

II. START-UP

ELECTRICAL

SUPPLY VOLTAGE	L1-L2	_____	L2-L3	_____	L3-L1	_____	
COMPRESSOR AMPS—COMPRESSOR A1			L1	_____	L2	_____	L3 _____
—COMPRESSOR B1			L1	_____	L2	_____	L3 _____
—COMPRESSOR C1			L1	_____	L2	_____	L3 _____
ELECTRIC HEAT AMPS (IF EQUIPPED)			L1	_____	L2	_____	L3 _____
SUPPLY FAN AMPS	_____		L1	_____	L2	_____	L3 _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE	_____	F DB (Dry Bulb)	
RETURN-AIR TEMPERATURE	_____	F DB	F WB (Wet Bulb)
COOLING SUPPLY AIR	_____	F	
GAS HEAT SUPPLY AIR (48PG)	_____	F	
ELECTRIC HEAT SUPPLY AIR (50PG)	_____	F	

PRESSURES

GAS INLET PRESSURE		_____	IN. WG		
GAS MANIFOLD PRESSURE	STAGE NO. 1	_____	IN. WG	STAGE NO. 2 _____	IN. WG
REFRIGERANT SUCTION	CIRCUIT A	_____	PSIG		
	CIRCUIT B	_____	PSIG		
	CIRCUIT C	_____	PSIG		
REFRIGERANT DISCHARGE	CIRCUIT A	_____	PSIG		
	CIRCUIT B	_____	PSIG		
	CIRCUIT C	_____	PSIG		

☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

GENERAL

☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

 Printed in U.S.A. Edition Date: 6/09 **Catalog No:48-50PD-02T**

 Replaces: 48-50PD-01T